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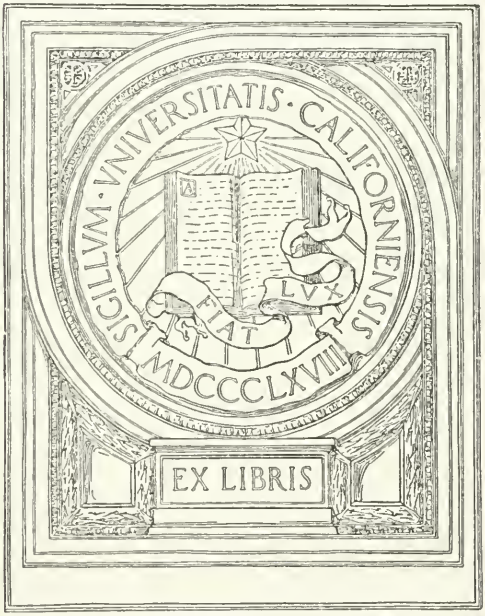

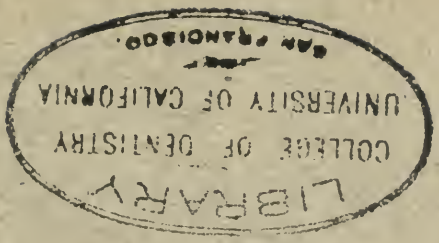

UNIVERSITY OF CALIFORNIA
WAR SERVICE RECORD

FOR THE

ACADEMIC YEAR 1917-1918

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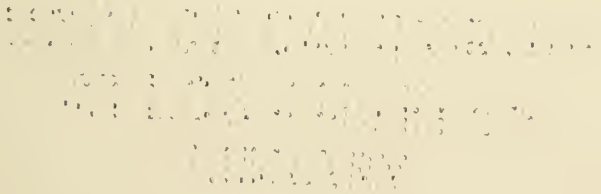
[Reprint from the UNIVERSITY OF CALIFORNIA CHRONICLE, Vol. XX, No. 3, July, 1918]



UNIVERSITY OF CALIFORNIA PRESS
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October, 1918

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UNIVERSITY OF CALIFORNIA WAR SERVICE RECORD

FOR THE ACADEMIC YEAR 1917–1918[1]

FOREWORD

The University of California, responding with an instinctive loyalty and an eager patriotism to the nation's call for service, is dedicated to the vitally important task of training men and women throughout the state in war work. With upwards of three thousand stars shining from its service flag, the University, through its several departments, its faculty, its alumni and its student body, is employing its full resources in striving towards the one great goal of bringing the war to a "speedy and successful termination." On the firing line in France, with the nation's battle fleet, in the shipyards, in the laboratories of war science, in the mines and on the farms, at home and abroad, wherever the call to serve has come, University men and women are at work. The University has given of its members, gladly and proudly. Not only are Californians listed on the Army, Navy, and Marine Corps rolls, but names on the lists of the California Council of Defense, the National Council of Defense, the United States Shipping Board, the Pacific Coast Research Conference, the United States Department of Agriculture, the United States Public Service Reserve, the War Trade Board, the Red Cross, and scores of com-

[1] Reprinted from the UNIVERSITY OF CALIFORNIA CHRONICLE, Vol. XX, No. 3, July, 1918.

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mittees and sub-committees of these and other organizations, bear substantial testimony to the part the University is playing in America's supreme crisis.

Further significant of the University of California's service to the nation and to the state is the unfolding of at least a dozen new plans and projects since the war record contained in the following pages was placed in the printer's hands.

Under the direction of Ira B. Cross, Associate Professor of Economics, a School of Employment Management has been instituted. The purpose of this school is to instruct employers of labor how to minimize personal and national loss resulting from the frequent turnover of labor; and how to keep their men content by a spirit of coöperation and mutual confidence between worker and director.

To aid the Signal Corps of the United States Army, the University has contracted with the War Department Committee on Education and Special Training to establish a School for Radio Electricians. Three hundred enlisted men will be given instruction in a continuous thirteen weeks' course with a view to fitting them to serve as non-commissioned officers.

The Navy also has called upon the University for trained men. It is announced that there will be a naval unit on the campus, either as part of the Students' Army Training Corps or as an exclusive training unit for prospective naval officers.

Uniforms worn by men of the Students' Army Training Corps will predominate at Berkeley when the fall term opens. College men will be enrolled in this new branch of the Army, will observe military discipline, and will prepare themselves for officers' training camps. It is proposed to develop in the universities of the country a large portion of the new officers, at the same time permitting properly qualified young men to continue their studies at institutions of their own choice.

Although specific mention is not made of the work of the members of various administrative departments of the University, the successful development of war work could not have reached its present mark without their earnest coöperation and their zeal in aiding the country in the capacity for which they were best fitted.

President Benj. Ide Wheeler, in appointing a Military and Naval Administrative Board to coördinate the activities of the various military and naval schools on the campus, has made it possible to establish and maintain complete harmony between the academic and military authorities. It is expected that the Board will secure the maximum benefit from the University's resources by the elimination of duplicate governing bodies. The Board represents President Wheeler in matters connected with the administration of military and naval affairs for the University. It coöperates with the Advisory Committee of Deans of the University, Professor Charles Mills Gayley, Dean of the Faculties, Professor William Carey Jones, Dean of the Graduate Division, and Professor H. Morse Stephens, Dean of the College of Letters and Science. The personnel of the Board consists of T. M. Putnam, Associate Professor of Mathematics and Dean of the Lower Division, chairman; James Sutton, Recorder of the Faculties; Ivan M. Linforth, Associate Professor of Greek; Robert G. Sproul, Assistant Comptroller of the University, and Morse A. Cartwright, Assistant to the President.

Recognizing that modern war is a contest waged not only by those wearing khaki or the bluejacket, but also by the non-combatant population at home, the Committee on Non-Military War Emergency Courses contemplates courses preparing men and women to solve the great problems connected with civil life in war time and with the days of reconstruction to come.

Under the direction of K. C. Leebriek, Assistant Professor of History, the University is providing speakers to

talk to selective service men on topics relating to health, and to the aims of the war. The idea was conceived by Adjutant-General J. J. Borree at Sacramento, who called upon the University of California to carry it out in detail. Local exemption boards at Berkeley and Oakland already have availed themselves of this branch of University activity.

To acquaint the public with the underlying causes of the great war, to give information upon the international significance of events transpiring on the battle front, and in the legislative bodies of the belligerent countries, it is proposed to give lecture courses on current events, not only in the class rooms in Berkeley but also in the cities of the state. Through the University Extension Division and other agencies, the enlightening influence of the University of California will be felt by thousands of citizens throughout the state.

Thus far the University of California's war record is a compilation of evidence of its services in time of war to America and to California. And its record will be as significant and inspiring for the remaining months of the year and for as many years as are necessary to "vindicate the principles of peace and justice in the life of the world as against selfish and autocratic power."

SCHOOL OF MILITARY AERONAUTICS

The School of Military Aeronautics at Berkeley is conducted by the University of California for the United States Army under a contract by which the University receives a specified tuition fee for each cadet receiving instruction. The University provides instructors, all necessary buildings for barracks and instructional purposes, and laboratory equipment, except special equipment such as airplanes and engines furnished by the United States Army.

The original contract, made in May, 1917, was for one year; a new contract is under consideration and will be signed shortly.

The Army is represented by the Commandant, who is in direct charge of the cadets and is the head of the school.

The University exercises its control through an executive head known as the President of the Academic Board. This official is directly responsible to the President of the University and to the Commandant of the School. Assisting the President of the Academic Board are a Vice-President, a Board of Examiners, and the following standing committees: Budget, Equipment and Buildings, Publications, and Schedule and Curriculum.

The course of instruction is prescribed by the United States Army. The course of eight weeks was increased in March, 1918, to twelve weeks. The curriculum has been changed from time to time by the authorities in Washington. At present there are six departments: Military Subjects, Signalling, Gunnery, Airplanes, Engines, and Observation. Each department follows a course definitely prescribed as to the number of hours devoted to each topic and as to the scheduling of work throughout the twelve weeks.

The work of each department is administered by a department head, appointed by the President of the Academic Board. Originally, the heads of departments, besides being responsible for the work of their departments, devoted some time to instruction. With the continual growth of the school, however, the work of the department heads is becoming more largely administrative.

Following is a list of the administrative officers, standing committees, and heads of departments on duty at the school:

Administrative Officers

Commandant
George B. Hunter,
Lieutenant Colonel, Signal Corps, United States Army.
Adjutant
Charles B. Crane,
Captain, A. S., Sig. R. C.
Detachment Commander
W. C. Brady,
Captain, A. S., Sig. R. C.
Supply Officer and Quartermaster
Jacob Mary,
2nd Lieut., A. S., Sig. R. C.
Post Surgeon
Bruno F. Sandow,
Captain, Med. R. C.
Assistant Post Surgeon
Jesse C. Edwards,
1st Lieut., A. S., Sig. R. C.
Albert S. Gough,
1st Lieut., A. S., Sig. R. C.
Post Dental Surgeon
G. F. Stoodley,
1st Lieut., Dental R. C.
Summary Court
Harold B. Reed,
1st Lieut., A. S., Sig. R. C.

President of the University
Dr. Benj. Ide Wheeler.
President of the Academic Board
Dr. Baldwin M. Woods.
Vice-President of the Academic Board
Mr. G. M. Thomas.

Standing Committees

Board of Examiners:
Prof. B. F. Raber, President.
Lieut. R. J. Heffner.
Mr. Walter Dreyer.
Equipment and Buildings:
Prof. B. F. Raber, Chairman.
Mr. R. A. Waite.
Publications:
Mr. H. A. White, Chairman.
Mr. G. M. Thomas.
Lieut. A. G. Smith.

Schedule and Curriculum:
Mr. G. M. Thomas.
Lieut. D. J. Conant.
Budget:
Lieut. H. L. McLean, Chairman.
Mr. G. M. Thomas.
Mr. R. M. Underhill, Accountant.

Heads of Departments

Military Subjects
Roy J. Heffner, 1st Lieut., A. S., Sig. R. C.

Signalling
Robert B. McPherson, 1st Lieut., A. S., Sig. R. C.

Gunnery
Mr. G. R. McDonald.

Airplanes
Howard L. McLean, 2nd Lieut., A. S., Sig. R. C.

Engines
David J. Conant, 2nd Lieut., A. S., Sig. R. C.

Observation
Mr. R. A. White.

Finances

Shortly after the formation of the school in May, 1917, a Budget Committee was appointed to keep the President of the Academic Board informed on finances.

The principal part of the accounting is done by the Accounting Department of the University. The Budget Committee makes monthly reports showing:

1. Receipts and disbursements from the opening of the school to the date of the report.

2. Receipts and disbursements for the month of the report.

3. An estimate of receipts and expenditures for the coming month, divided according to accounts and departments.

The cost of permanent improvements for the duration of the war, such as barracks and laboratory buildings, is charged off in monthly installments extending over periods ranging from six months to a year. Three laboratory buildings and five barracks have been built since the establishment of the school.

Buildings and Equipment

The University has constructed laboratory buildings for the School of Military Aeronautics on the campus near the Mechanics Building. The first building constructed was 60 × 120 feet and provided sufficient space for laboratories essential in the study of signalling, gunnery, airplanes, engines, and aerial observation. As the size of the school increased the building became inadequate, and it was necessary to make two additions to the original structure. It also has been necessary to construct an engine laboratory on another part of the campus. For lecture purposes, the rooms of the regular University buildings have been placed at the disposal of the School of Military Aeronautics.

At the opening of the school, cadets were quartered in fraternity and boarding houses near the campus. The University at once undertook the construction of barracks, and there is now available one large two-story building just south of the campus and four smaller units on the campus, the last four units being of similar construction. Space for any future increase will be provided by building additional units of the same type as the four smaller barracks.

Department of Military Subjects

Lieutenant R. J. Heffner, Head

The Department of Military Subjects has been in operation since the opening of the school in May, 1917. At that time the work of the department covered four lecture hours per week, given by one instructor, and divided into three topics: Army Regulation, Military Law, and Organization of Modern Foreign Armies.

In July, 1917, the staff of the department was increased to two instructors. A total of sixteen hours per week and a final examination at the completion of the series of

lectures were provided. The scope of the course was enlarged to include one lecture each on the organization of the United States, German, British, and French armies. Since that time instructors and lectures have been continually added. Both the topics discussed and the number of hours devoted to each have been increased.

At the close of last year a total of twenty-eight hours of work per week was provided for in the curriculum, including a final examination and lectures on Organization of the Schools of Aeronautics, Military Law, Military Discipline, Esprit de Corps, Military Courtesy and Ideals, Administration and Organizaton of the Unted States Army, Regulations of the United States Army, Military Hygiene, Sanitation and First Aid, Army Paper Work, Methods of Modern Warfare, and Morale of the Air Service.

In March, 1918, the number of hours of work per week was virtually doubled, and at present reaches a total of fifty-four hours. The course includes lectures, demonstrations and examinations. The following brief outline of the present instruction may prove of interest:

The subjects of Military Hygiene, First Aid and Sanitation are discussed and demonstrated in a series of seven lectures. Elementary principles of personal hygiene, communicable diseases, camp and barracks sanitation, emergency treatment for the injured, etc., are explained.

Military Discipline receives but one hour in the lecture room, but its principles are practiced throughout the entire course of twelve weeks.

Military Courtesy is discussed in a series of two lectures. Rules for saluting, honors and courtesies to the colors and the national anthem, etc., are explained and emphasized.

The principles of Guard Duty are brought out in two lectures.

The subject of Administration and Organization of the United States Army is taken up in brief synoptical form, three hours being given to such discussion.

The Paper Work of the Army, including military correspondence, blank forms, requisitions, accounts, reports, etc., receives attention, ten hours being devoted to lectures, discussions and practice.

Army Regulations governing both officers and enlisted men are studied.

Military Law and the Articles of War, including the system of military tribunals, courts and commissions, is discussed in a series of lectures covering five hours. At the completion of this series the students themselves hold a mock court-martial for practice in legal work.

Methods of Modern Warfare, including construction of trenches, service in the trenches, methods of attack and defense on European battle fields and organization of modern foreign armies are discussed in a series of four lectures. Seven hours of discussion and drill in the use of gas masks give the student elementary instruction in defense against gas attacks.

One hour is spent in discussing the elementary principles and benefits of infantry drill as practiced by members of the Aviation Service. The proper methods of giving commands as well as general theories of drill movements are explained. This is coördinated with the practical work on the drill field.

In the last lecture the subject of Morale in the Air Service is discussed with an idea of building up pride in the organization, faith in its progress and powers and general satisfaction among its members.

Eleven instructors are connected with the department. Students are furnished with sets of notes mimeographed in skeleton form and are instructed to fill in details from the material presented in the lecture room. In this manner a logically arranged set of notes is assured the student, who is given the opportunity of assimilating the information through the act of writing it himself, rather than reading it from a text. Each week sees changes and improvements in accordance with the policies of the War Department.

The practical work in the Department of Military Subjects, consisting of drill, guard mount, etc., although listed under this department is actually conducted separately, under the direction of Lieutenant Harold B. Reed as the Department of Drill and Discipline.

Department of Signalling

Lieutenant R. B. McPherson, Head

The Department of Radio and Signalling was organized as a part of the school in May, 1917, for the purpose of instructing cadets in radio telegraphy, and the Radio Laboratory of the College of Mechanics was turned over for its use. First practice in signalling was given in one of the fraternity houses, where the cadets were quartered at the beginning of the school.

The name of the department was later changed to the Department of Signalling, although the scope of the course remained practically the same. Practice in sending and receiving the International Morse Code occupies most of the time of the cadets. This work is given on silent code practice apparatus which permits several hundred students to have simultaneous individual practice time without any interference.

The signalling laboratories are located in the "aero" laboratory and the barracks units built by the University, the laboratory in "C" barracks being large enough to accommodate 240 men doing individual work at the same time. Sufficient apparatus is available at the barracks for the cadets to engage in a certain amount of night practice in addition to the regular work required in the daily curriculum.

The course also includes lectures on the theory of wireless telegraphy and several hours are devoted to visual signalling.

As the size of the school has been increased it has been necessary to increase the staff from month to month and it is believed that the efficiency of the department has more than kept pace with its growth.

Department of Gunnery

Lieutenant G. R. McDonald, Head

The Department of Gunnery is intended to fit the cadet for the advanced training which he is given at the flying field. The curriculum followed is based on the experience gained by the Allies, the cadet being taught to use the machine gun effectively as a weapon of offense and defense. Special attention is given to work in the laboratory, as the aerial gunner must possess a fair amount of skill as an armorer. This qualification enables him to keep his gun in action under the most trying conditions, where the inability successfully to reduce a jamb would be fatal.

Laboratory work covers practice in the dissembling and assembling of the various guns as well as the removal and replacement of important parts of the gun mechanism. After the work is understood the adjustment and manipulation of the fully assembled gun is practiced. This is followed in a systematic manner until the cadet, even when blindfolded, is able to perform any operation which the instructor may direct. This is the final proof of a knowledge of the gun mechanism, and insures against the fumbling or maladjustment of parts when working under adverse conditions.

The training in the laboratory is supplemented by firing practice on the range where attention is paid to marksmanship in handling of the gun. Trap shooting is a valuable adjunct to this work, as the prospective aerial gunner thereby develops facility in judging accurately when firing at a swiftly moving target. An interesting feature of the firing practice is the drill in correcting stoppages and

jambs. By applying the knowledge gained in the laboratory and in firing practice he is able to diagnose the trouble and put the gun in action.

Space for this work is provided in the temporary buildings erected for the School of Military Aeronautics on the campus, and on the range back of the Big "C". Machine guns and accompanying material of the same pattern as the Allies are using at the front, enable the cadets to gain the experience needed to make them practical gunners.

Trap shooting, although included under Organized Sports, is conducted by the Department of Gunnery.

Airplane Department

Lieutenant H. L. McLean, Head

When the School of Military Aeronautics started in May, 1917, the Airplane Department was housed in one end of the original Aeronautics Laboratory. Two obsolete training machines were used for instruction in alignment and a few lectures were given in Theory of Flight, Slicing, Care and Types of Machines.

The department has gradually grown until it is the exclusive occupant of one building, in addition to a large part of the original building and annex. Eight airplanes are in use for instruction purposes, two being of the very latest type of training machine. A repair laboratory has also been fitted up where cadets are given practical instruction in making wire splices of different kinds and in patching punctured and torn wings.

Lectures are given, forty-eight hours in all, on the Theory of Flight, Repair and Care of Airplanes, Instruments, Meteorology, and Types of Airplanes at present in use.

The faculty of the department at the present time is composed of ten instructors, with three more to report within the next few weeks.

Engines Department

Lieutenant D. J. Conant, Head

The Engines Department began its instruction in June, 1917, the curriculum consisting of a series of lectures with a laboratory course. The lectures covered the use of tools, fundamental principles of airplane engines, the theory and operation of carburetors and magnetos, lubrication and cooling systems. In the laboratory the cadets were divided into groups of eight, each group having an instructor who illustrated the details of construction, operation, and adjustment of two makes of airplane engines.

At first the staff consisted of three members, but with constant changes in the curriculum and the addition of new equipment and engines, more instructors had to be secured. A number of large colored charts and working models of parts of engines were made by members of the staff and were used extensively in the class rooms.

When it became necessary to run the airplane engines, they were mounted on special stands outside of the building. The troubles experienced in engine operation were observed, the cadets studying the causes of the difficulties and learning how to remedy them.

The new curriculum, a twelve weeks' course, gives the Engines Department a broader field of activity. The new course requires work in assembling and disassembling of engines, their testing, and the careful consideration of the care and operation of engine accessories. The increased duties of the department required a larger number of engines and equipment and it became necessary to erect a new building. Nine test stands and eight work rooms for assembling and disassembling, besides a small shop for the maintenanance of the engines and the tool equipment were provided.

The engine equipment totals twenty-four complete engines and the parts of two others. The staff comprises fifteen instructors.

Department of Observation

R. A. Waite, Head

The work in the Department of Aerial Observation, as it was called in May, 1917, consisted of lectures and practice in Map Reading, and lectures on Coöperation of Airplanes with Artillery, Coöperation of Airplanes with Infantry (or Contact Patrol), Reconnaissance, and Aerial Photography. The miniature range, or the artillery observation range, was built for the practical work in this department, principally in connection with the course on Coöperation of Airplanes with Artillery.

Until January, 1918, all instruction in this department was taken directly from present day British methods. After January the modern French system was substituted. In October, 1917, the course in Map Reading was taken from this department to form the basis for a new Department of Aids to Flight. Lectures on Theory of Flight, Cross-country Flying, Meteorology, Night Flying, Astronomy, and Instruments comprised the remainder of the work in this department. In January, 1918, the new miniature range, capable of accommodating seventy-two men, was put into operation and the old range, with a capacity of twenty-six men, was abandoned.

In May, 1918, following a very material change in the work, the name of the department was changed to Observation. The lectures on Coöperation of Airplanes with Artillery and the practice work on the miniature range were increased. The lectures on Coöperation of Airplanes with Infantry and Reconnaissance were eliminated. The lectures on Aerial Photography were reduced to two lantern slide lectures covering the interpretation of aerial photographs. The work in Map Reading was increased slightly and again brought under the Department of Observation. The work that had been given in the Department of Aids to Flight was either eliminated or transferred to other departments.

The activities of the Department of Observation now cover Map Reading, lectures and practice, including the interpretation of aerial photographs; Coöperation of Airplanes with Artillery, and lectures and practical work on the artillery observation range.

The artillery observation range, or miniature range, was adopted in the aviation ground schools to provide some practical means of aerial observation. The general method was taken from the British ground schools, but the manner of working out the details and of giving instruction differs in each of the various ground schools in this country.

The essential feature of the range is a painting of a certain section of country as it would appear from an airplane. The painting is made on canvas, sized to render it translucent, and is taken from a certain section of the artillery map furnished each cadet. The scale is such as to present to the eye of the observer in the gallery sixteen feet above it, the same appearance as the actual country from a height of about eleven thousand feet.

There are two balconies extending around the room, the upper one being the observers' gallery and the lower one the battery commanders' gallery. There are seats for thirty-six men in each gallery, thus making it possible for two instructors to supervise a class of seventy-two men, working in pairs. Communication between two men working together as observer and battery commander is established through imitation wireless sets. The observer may receive messages by head telephone, signal lamp or by miniature ground-strips, the battery commander receiving always by head telephone.

In the floor are set about five hundred small electric lights. Some of these illuminate numerals which represent definite points for the observer to locate and report. Others are points of light representing bursting shells around the thirty-six targets, one for each battery table. The latter, or "bursts," are controlled by switches on the battery table, which the battery commander can operate

when the signal to fire is given by his observer. The observer then estimates the correction for this burst and signals it to the battery commander by wireless. In this way practice is given in estimating corrections for artillery fire, and later, in conducting shoots.

Department of Organized Sports

F. L. Kleeberger, Director

General Statement.—The work of the Department of Organized Sports of the School of Military Aeronautics has been under way during the past four months. From the very beginning a definite plan of organization of athletic activities has guided the work of this department. Due to the curtailment of the time originally allotted for athletic sports, and due to the frequent readjustment of the curriculum of the School of Military Aeronautics, the work so far has been in a state of experimentation from the standpoint of detailed procedure. Throughout the organization and administration of the athletic work the principles originally presented by General Squier have been kept constantly in mind. It has been the aim of the Department of Organized Sports to provide athletic activity which would react on the men of the school in the maintenance of health, in the promotion of recreative values and in the development of physical cleverness. The work is expected to prove of practical value to fighters in meeting the exigencies of their future work. Care has also been exercised to provide types of group competition which might prove conducive to the development of group loyalty, esprit de corps and personal morale.

Organization of Athletics.—Squadrons A to O, inclusive. Boxing drills and wrestling drills. Individual competition, each corporal forming his squad into a ring and pitting his men one against the other in rotation, grading each man upon his individual efficiency. Each squad, through this process, to determine the two boxers

who are to represent it in the intersquad and intersquadron competition to be arranged each week. Efficiency of the individual to be graded by the corporal in connection with the athletic instructor.

Squadrons E and F. Agility training through individual and team participation in competitive games, relay racing, wall scaling, practice in lifting and carrying injured or helpless persons, hand wrestling, tug-of-war, etc. Efficiency of the individual to be graded by the corporal in consultation with the athletic instructor. Intersquad and intersquadron competition to be arranged for each week.

Squadrons G and H. Track and field training. Groups to be kept in military units (squads, platoons, etc.), during the practice of running, jumping, hurdling, vaulting, grenade throwing, etc. Individual competition within each squad under the direction of the corporal to determine the representative for the intersquadron field and track meet, based upon six events: high jump, broad jump, hand vault, grenade throw, hurdle race, and short dash. (The competition will also include a relay race.) Efficiency grading of each individual by the squad leader in consultation with the athletic instructor.

Squadrons I to M, inclusive. Trap shooting on a range constructed by the University on the hills back of the Big "C." Each squadron has two two-hour periods at the traps and in addition has one hour scheduled for a "hike" through the hills followed by a plunge in the swimming tank or shower at the gymnasium. Trap shooting, although included under supervised sports, is conducted by the Department of Gunnery.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS

The total enrollment in the Department of Military Science and Tactics in August, 1917, was 1265 (47 officers and 1218 non-commissioned officers and privates). As a result of the selective draft and voluntary enlistment, by April 29, 1918, but 38 officers and 810 non-commissioned officers and privates remained.

Under General Order No. 49 of the War Department there was established at the University of California a unit of the Senior Division of the Reserve Officers' Training Corps, in charge of Captain L. M. Welch, Professor of Military Science and Tactics. Graduates of the Senior Division were eligible to enter officers' training camps. Students, if under twenty-one years of age, were required to attend the summer camps provided by the government.

The prescribed amount of military work has been three hours a week. This will be increased materially under the new Students' Army Training Corps plan of the War Department. A unit of this corps will be established at the University of California.

SCHOOL OF VOCATIONAL TRAINING

With approximately 100 men assigned for service, the School of Vocational Training opened at the University of California on July 1, 1918, under the command of Captain A. H. Allen, former Manager of the University Press, assisted by Lieutenant A. W. Mohr. Four University instructors are training the recruits in telegraphy, radio, blacksmithing and electrical machinery. F. S. Foote, Jr., Professor of Railroad Engineering; W. C. Pomeroy, Assistant in Physics, H. A. Scott, and G. W. Cattell, comprise the faculty, while the following former students of the University are included in the new school: W. V. Atkinson, C. S. Capp, B. C. Harris, J. G. Larson, J. S. Moore, Jr., P. Prell, H. F. Rohrbach and J. Wimmer.

TRAINING FOR THE UNITED STATES NAVY AND FOR THE MERCHANT MARINE

At San Francisco

Courses contributing to the training of men desiring to qualify as officers in the United States Naval Forces and in the Merchant Marine were inaugurated during the summer of 1917 by the Berkeley Astronomical Department and the Committee on Mathematical and Astronomical Investigations of the Pacific Coast Research Conference of the State Council of Defense. These courses led to an active and effective coöperation of the University with the United States Shipping Board and the United States Navy. A course in Navigation and Nautical Astronomy, principally designed to produce a supply of qualified teachers, was included in the Summer Session of 1917, under F. J. Neubauer, Instructor in Astronomy.

In the meantime these plans, through the National Research Council, were brought to the attention of the United States Shipping Board, Mr. Henry Howard of Boston, Director of the Shipping Board's Recruiting Service and founder of its Navigation Schools, and Dean Alfred E. Burton of the Massachusetts Institute of Technology, Special Expert of the Shipping Board in charge of instruction, who had decided to extend the Shipping Board's chain of Navigation Schools to the Pacific Coast.

Mr. Farnham P. Griffiths, an alumnus of the University and Lecturer in Law in the School of Jurisprudence, was appointed Section Chief of the Recruiting Service in California, to have complete charge of the Shipping Board's Navigation Schools in California. In August, 1917, plans for the coöperation of the Berkeley Astronomical Department and the University Extension Division with the Shipping Board were completed. Suitable quarters had been secured from the State Harbor Commissioners in the Ferry Building for the housing of the Navigation School of the

Shipping Board in San Francisco, of the Navigation School to be conducted by the Extension Division, and of the Navigation School of the City and County of San Francisco. The Harbor Commissioners, the San Francisco Board of Education, and the Extension Division shared in the expense of outfitting the quarters.

The following instructors, all present or former members of the University, were appointed by the Shipping Board to serve in various Pacific Coast navigation schools: F. J. Neubauer and Sturla Einarsson, Instructors in the Berkeley Astronomical Department, for San Francisco; H. D. Curtis, Astronomer in the Lick Astronomical Department, for San Diego; W. F. Meyer, in charge of the International Latitude Observatory of the U. S. C. G. S., formerly Instructor in the Berkeley Astronomical Department, for San Pedro; A. R. Williams, Assistant in Mathematics, for Portland, Oregon; and C. D. Shane, Fellow in the Lick Observatory, for Bellingham, Washington. Captain George Harding was appointed to complete the staff of the San Francisco School.

Within three days after these arrangements were perfected instruction commenced at San Francisco, San Diego and San Pedro, and a week later at the more distant places. The original arrangements provided that in return for the University's coöperation, Extension Division students without sea experience should receive free instruction in the Shipping Board's classes, to increase the number of each class to thirty, as it was not expected that enough certified applicants with sea experience would be immediately available. From the start, however, the response of men with and without sea experience was so large that it became necessary to organize separate classes for the Extension Division. The University Extension Division opened free day and night classes in Navigation and Nautical Astronomy, conducted in the Ferry Building, San Francisco, on September 11, 1917. The courses were under the general supervision of A. O. Leuschner, Director of the Students'

Observatory, and in charge of Dr. Neubauer and Captain George Harding. Thirty-nine students took the day course. Twenty-two successfully completed it, fifteen with the highest record possible. Ten other extension students completed the course, by courtesy of the Shipping Board, in one of the government classes. Many of these thirty-two students secured appointments as cadet officers on the vessels of the shipping interests in San Francisco, which were coöperating through an Advisory Board formed by the Section Chief of the Shipping Board. When these men have obtained the necessary sea experience they will be entitled to take the government examinations before the United States Inspectors. Seventy-three students enrolled in the night course. On November 5, a third course was started with an enrollment of forty-seven. Eighteen students were also enrolled at Los Angeles in an extension course conducted by S. B. Nicholson and Alfred Joy of the Mount Wilson Solar Observatory of the Carnegie Institution. The total number of students admitted to extension courses to December, 1917, was one hundred and eighty-seven.

These students, who were without sea experience, had enrolled in the expectation that the Shipping Board would accept them for sea training, or in anticipation of being accepted as cadet officers by the merchant marine. When it was found that arrangements could not be made on the part of the Shipping Board for the acceptance of men without sea experience, and when it was realized that but few positions as cadet officers were available, the majority enrolled in the United States Naval Reserve. This led to a reorganization of the work in the University Extension so as to meet, first of all, the needs of men desiring to prepare themselves for the ensign's examination.

Recently the Shipping Board has made provision for the training of men without sea experience by providing school ships under a Sea Service Bureau. The Extension Division classes continue to be open to students desiring to

enlist with the Shipping Board or to enter the Merchant Marine as cadet officers, subject, however, to the entrance requirements set for men preparing for the ensign's commission. The progress of the Shipping Board's School under the administration of Section Chief Griffiths is set forth below.

On Tuesday evening, December 11, forty of the extension students who had enrolled in the Naval Reserve presented a petition for a short course in Naval Regulations, Seamanship and Ordnance, to be completed before reporting for duty on January 1, 1918, at the San Pedro Naval Training Station. At a conference held the following morning with Lieutenant-Commander F. P. Gaddis of the San Francisco Naval Training Station at Yerba Buena Island, arrangements for the desired course with Boatswain Wallace Hanna in charge were completed and instruction began at the Ferry Building the same afternoon.

At the same conference with Lieutenant-Commander Gaddis, arrangements were made for instruction to be given at the University in Naval Regulations by Ensign F. Bense, and in Seamanship and Ordnance by Ensign E. F. Sale. A series of courses in Naval Training was agreed upon and the same afternoon the tentative plan for a curriculum in naval training was submitted to the Executive Committee of the Engineering Council. The plans were approved by the Committee and later by President Benj. Ide Wheeler, who announced them at the University Meeting the following Friday. This marked the beginning of the now well-organized curricula in Naval Training, both in the University at Berkeley and in the University Extension Division at the Ferry Building, San Francisco. Associate Professor of Practical Astronomy R. T. Crawford was placed in charge of the curriculum at Berkeley as Chairman of an Administrative Board. Later Dean T. M. Putnam, Associate Professor of Mathematics, succeeded Professor Crawford, after the latter's entrance into the United States Army as Major in the Signal Corps. An

account of the naval training work in the University at Berkeley is given elsewhere.

The Commandant of the Twelfth Naval District, Captain Russell, has sanctioned the voluntary efforts of the University and is giving the University officers in charge of the work at Berkeley and in San Francisco the benefit of his advice. Permission is being granted to men in service to attend the courses, and qualified men have been enrolled in the Naval Reserve with time extensions to take and complete the courses, whenever practicable.

The instruction at the Ferry Building is now organized as an eight weeks' intensive training course, under the supervision of Professor Leuschner. The instruction is given by Ensign F. Bense, United States Navy, in Naval Regulations, Ensign Miller in Seamanship and Ordnance, Captain George Harding and Mr. H. G. Wrecklage in Navigation and Nautical Astronomy. The admission requirements are the same as for the Officers' Material School of the United States Navy, from which selected men are sent to the United States Naval Academy at Annapolis. The first intensive training course began on January 7, 1918, with seventy-two students, the second on March 15, with sixty-five students, the third on May 20, with one hundred and thirty-four students. The next course began July 22, 1918, with a very large enrollment, two hundred and fifty applications being received. On September 23, the fifth course opened with a large enrollment. Detailed reports on the men enrolled are furnished regularly to the Commandant. University credit is given for all the courses. Students who satisfactorily complete all the courses offered are given certificates signed by the President of the University. The advantages that students gain from the naval training offered by the University are greater eligibility for admission to the Officers' Material School, shortening of their training in theoretical subjects while in service and the opportunity of securing higher rank in the examinations given by the United States Navy for the ensign's commis-

sion, after they have been in service a sufficient length of time and have qualified as officer material.

At the initiative of Lieutenant-Commander Gaddis and with the sanction of Captain Durrell, Commandant of the San Francisco Naval Training Station at Yerba Buena Island, the University has also been given the opportunity to coöperate in the conduct of an officers' training school for men in the regular Navy at the Ferry Building. This school runs parallel with the intensive training school for the United States Naval Reserve. Two subjects are taught in eight weeks—Naval Regulations, and Navigation and Nautical Astronomy. Men in service in the regular Navy at the San Francisco Naval Training Station are chosen by the Commandant from high school graduates and college men for the Commissioned Officers' School, University of California Extension Division, and for the United States Naval Training Station, San Francisco, California. To the first school commencing January 7, 1918, forty-four men were detailed. Of these, thirty-nine were recommended as qualified and sent east to be entered for competitive examination at Norfolk, Virginia, on March 23. One hundred and eighty-five men entered the competitive examination. Of the University of California men, 75 per cent passed, as against 52 per cent of the men trained elsewhere. Thirty men have graduated from the second school; the third school ended July 15. The men of the first school have made a notable record and have contributed to California's rating by the Bureau of Navigation, which at present is the highest in the country. The University is endeavoring, in so far as it is capable of being of service, to assist the Commandant of the Twelfth Naval District in maintaining this rating. The courses were inspected in April by Rear Admiral Ross, of the Bureau of Navigation, who is in charge of officers' training in the United States Navy, and received his approval. The graduates of the University's three distinct naval training schools who are now in service are writing enthusiastically regarding the

training they have received. The University seems to be rendering a real and valuable service through its naval training courses in the government's effort to meet the demand for junior officers.

Until June, 1918, Mr. Griffiths was Section Chief for California of the Shipping Board Recruiting Service with direct charge of the navigation and engineering schools of the Board in this state. Between August, 1917, and June, 1918, four navigation schools and one engineering school were organized. The former were located at San Pedro, Los Angeles, and San Francisco, respectively, and showed to June 30, 1918, enrollments as follows:

San Pedro (This school was closed December 15, 1917)	35
San Diego	50
Los Angeles	122
San Francisco	200

The Engineering School which was opened May 20, 1918, at the University of California by the Shipping Board in conjunction with the University, had approved seventy-three applications for admission up to June 30, 1918. Of the graduates of the various navigation schools one hundred and ninety-one had been duly licensed as officers in the American Merchant Marine up to June 20, 1918, most of them as second mates, and of these the vast majority have gone to sea.

The San Diego Navigation School was originally under the instruction of Dr. Heber D. Curtis, Astronomer at the Lick Observatory. He was succeeded by Mr. Oscar A. Littchen, a graduate of the San Pedro School. The San Pedro School was under the instruction successively of Dr. F. J. Neubauer of the Astronomical Department of the University and of Dr. W. F. Meyer of the International Latitude Observatory at Ukiah. The teachers in the Los Angeles school have been Captain H. C. Frerichs and Dr. Neubauer. The San Francisco School from the beginning has been under the head instructorship of Professor Sturla

Einarsson of the Department of Astronomy of the University, with Dr. Neubauer, Captain George Harding and Mr. Lew Spaulding as assistants at different times. The instructor in charge of the Engineering School at Berkeley is Mr. David W. Dickie, marine architect of San Francisco and lecturer in the University. He is assisted in the instruction by Irving M. Scott, Arthur B. Domonoske and Ernest J. MacDonald, all of the faculty of the University.

Actual sea experience is prerequisite for admission to these engineering and navigation schools of the Shipping Board, with the exception that men with engineering experience may enter the engineering schools without sea experience, on the understanding that they will go to sea as oilers, firemen, or in similar capacity for the requisite time before receiving their licenses as engineering officers from the United States Steamboat Inspection Service. The purpose of the schools is to train men to be deck officers and engineering officers in the American Merchant Marine and thereby supply the pressing call for men to take charge of the great fleet of merchant vessels recently constructed or now in course of construction by the government and private owners.

COURSES PREPARATORY FOR SERVICE IN THE NAVY

At Berkeley

In January, 1918, ten courses covering the subject matter required in the examination for the commission of ensign and two additional courses recommended as electives were offered in the curriculum of the University. These courses were based on the curriculum of the United States Naval Academy at Annapolis. This plan covered the following subjects: trigonometry, naval and nautical astronomy, naval history, oceanography and marine meteorology, ordnance and gunnery, seamanship, naval gunnery, naval regulations, physical education and drill, marine engineering, and naval architecture.

The ensign examination for a commission in the line requires training in ordnance and gunnery, seamanship, naval gunnery, naval regulations, and navigation and nautical astronomy. For the commission of ensign in engineering, naval regulations, marine engineering, and naval architecture are required. The courses in naval history and oceanography and marine meteorology are recommended as electives. When the course in naval history was instituted in this connection it was the second of its kind given in a university of the United States—the only other course in naval history was in the curriculum of Harvard University.

Enrollment in the principal courses in this field varied during the term from seventy-six to one hundred and eight. Of the total number registered thirty-six were members of the Naval Reserve who had been granted relief from active duty until May 15 for the express purpose of taking these courses. The students who completed the required courses with a satisfactory record were given a certificate to that effect. The number of men who completed the required courses by May was fifty-nine. There are now enrolled thirty-four others who are applicants for the certificate at the end of the Summer Session of 1918 or in December, 1918. The scholarship standing in these courses has been almost uniformly high. It is expected that after practical training on board ship the holders of these certificates will be given an opportunity to take the qualifying examinations for commissions.

The work of instruction in these courses has been carried on by members of the University faculty. Dean T. M. Putnam is now in general charge of this curriculum. Although the University has not received official recognition for this work, much personal encouragement has been received from the Commandant of the Twelfth Naval District and the officers at the training station on Yerba Buena Island. They have allowed two officers, Ensigns Sale and Bense, to conduct three of the courses in the even-

ing. In addition Chief Yeoman Segure has been assisting in the course, conducting the physical exercises.

The work was recently inspected by Rear Admiral Ross of the United States Navy. It is proposed that these courses shall be continued during the year 1918–19.

COURSES IN MARINE ENGINEERING AND NAVAL ARCHITECTURE

The University announced courses in Marine Engineering and Naval Architecture on January 15, 1918. When the courses opened twenty-one students enrolled. These courses have continued throughout the half-year. The students admitted were either graduates from, or seniors in technical schools or colleges of recognized standing.

The work in Naval Architecture has been arranged in conformity with directions issued by the United States Civil Service Commission for ship draftsmen. The items included in this course relate to ship design and construction and cover in particular displacement, buoyancy, stability, resistance and propulsion, structural arrangement, specifications, drawing and design. The students enrolled have worked out a design for a steel tug one hundred feet long, and in this work they have gone into sufficient detail to see how a ship design is obtained.

A number of persons interested in the school have donated certain parts of apparatus used on board ship. Shipbuilding companies in the San Francisco Bay district have entertained the members of the class at the shipyards, showing them in detail the methods used in shipbuilding. Members of the class have also been allowed to operate certain machinery of the Key Route Ferry system, thereby demonstrating the actual working of a completed design. The work has been give nunder the direction of Professor David W. Dickie, Lecturer in Marine Engineering and Naval Architecture.

Beginning on May 20, 1918, a course in Naval Architecture was given for ten or twelve weeks. This course followed in outline a special short course in Naval Architecture suggested by the United States Civil Service Commission at Washington. This work has been in charge of Mr. Dickie. It is contemplated that the work in Marine Engineering and Naval Architecture will be continued at the University during the year 1918–19.

COURSES IN RADIO COMMUNICATION

During the past year, work in Radio Communication has been given in connection with the School of Military Aeronauties, a review of which has already been made. Mr. G. L. Greves of the Department of Electrical Engineering has also given a number of courses in that department. During the regular Summer Session he gave a six weeks' elementary course in Radio Communication.

A new and more complete course commenced on May 20 and continued for twelve weeks. This course is designed to cover the field in such a manner as to meet the demands of the War Department. A prospectus was received from the office of the Chief Signal Officer of the Army, and a University committee formulated the course in accordance with those suggestions. The war application of the information given in the course is extensive and includes systems of radio transmission, including commercial and military equipment, elementary telegraphy, telephony and circuit work. It also includes code practice to the extent of four hours per week.

The prerequisites for admission to such a course, as outlined by the War Department, include certain preliminary training in electrical engineering. At the present time students of junior standing or above who are enrolled in electrical engineering, students who have had courses in electrical engineering dealing with direct and alternating current machinery and those whose practical training has fitted them to undertake the work are admitted to the course. The last class includes amateur radio operators who have had considerable experience, and who have a good understanding of the theory.

MILITARY BUREAU

Even before President Wilson's message of April 2, 1917, the Regents had passed a resolution placing the resources of the University of California at the disposal of the national government in the event of war. As one means of carrying out their action, they established a Military Bureau under the direction of L. J. Richardson, Associate Professor of Latin, and Homer Havermale, Alumni Secretary. Its first business, under date of April 12, 1917, was to ask all men of the University body—faculty, alumni, and undergraduates—to fill out a personnel index card. The request included the following statement:

ORGANIZATON FOR NATIONAL SERVICE

To the Faculties, Alumni and Students of the University of California:

The President and the Regents have placed the University of California in the present crisis at the service of the state and federal governments. Accordingly, the University is taking account of its resources in both information and materials. Moreover, it is putting on record what each member of the University—faculties, administrative staff, alumni, students, and former students—has done, is doing, or in the event of need could do for the general defense.

To assist in this work you are asked to fill out the enclosed card, and to return it at once. The University would like also to include in this census the families of its officers, alumni, and students, and upon request cards will be sent for the registration of these persons. All information set down upon your card will be regarded as confidential. The signing of the card in no wise commits you to enter the government service unless you desire to do so.

The responses numbered 3070, and nearly all of them offered services in one form or another.

The functions of the Military Bureau have undergone many changes and much expansion since the issuance of the original questionnaire. The Bureau as developed has three separate functions: it serves as an information office, a personnel office, and as a liaison office between the University and various military departments and bodies.

An average of 2500 persons per month seek the Military Bureau for information and advice. The variety of questions asked is infinite. Many seek information regarding draft regulations, army and navy regulations, army and navy orders, military procedure and methods. In this connection it may be said that Military Bureau endeavors to answer every reasonable question asked in good faith.

It also coöperates to such extent as is possible with committees and organizations engaged in war work, such as training, publicity, relief or reconstruction activities.

As a personnel office the Military Bureau has occupied a distinctive place in the general military establishment. For a long time the office was connected with the Intercollegiate Intelligence Bureau, a civilian body operating with the approval of the War Department. The absorbing of the Intercollegiate Bureau by the Adjutant-General's office brought a new standing to the Military Bureau, which is now directly connected with that office in Washington.

From the Adjutant-General's office requisitions for skilled men come to the Military Bureau. These calls come also from various department chiefs who look to universities for their personnel. Typical calls follow:

June 9, 1917, a call for an alumnus in each of the following cities: Los Angeles, Portland, Salt Lake City, and San Francisco. The men selected are to be on committees whose functions are: (*a*) To investigate the ability, reputation and association of any one desired for special work by the national government in order to make sure of fitness and loyalty; (*b*) to assist in discovering for the national government men in various occupations who could be induced to leave their work in special cases where their ability is particularly desired by the government; (*c*) to arrange with local firms and organizations to release certain of their trained help when the need by the government is very great indeed and probably could not be satisfied in any other way.

May 9, 1917, a call came to supply for service in France an ambulance unit consisting of a first sergeant, second sergeant, corporal, two orderlies, two clerks, twenty-four drivers, three mechanics, and two cooks. Men were selected and enlisted for these positions and are now in the United States Army Ambulance Service under com-

mand of Lieutenant-Colonel Percy Jones. The University of California unit is headed by Lieutenant John F. Edwards, and is officially designated as Section 86 of Battalion 21, U. S. A. Ambulance Service. The needs of the men are being looked out for at home by the Friends of Section 86, an organization of parents and friends, who are sending to France clothing, reading matter and other things needed by the men.

October 5, 1917, a call to secure three or four assistants in the War Trade Intelligence Division of the Export Administrative Bureau.

A call for women to serve as nurses in France; a similar call for telephone operators.

A request to examine, induct and assign to Edgewood Arsenal, Md., one hundred chemists.

A request to supply men for the Enlisted Specialists' Preparatory School at Fort Winfield Scott.

The above calls indicate roughly the variety of requests made. Since the organization of the office 380 additional calls have been received, many of them being requests for specialists.

These calls are made known to the public and to the alumni of the University through newspapers, University publications and the *Alumni Fortnightly*. Applicants are examined and are either inducted, or their credentials are rated by committee men in the faculty and then sent to authorities requesting assistance.

Besides acting as personnel agent at the specific request of the government, there is another function, namely to help men and women secure places in the national service. Persons who have decided to offer their services to the army, navy or other branches of the national government usually find here both information and direction. The office in this phase of its work is somewhat like an employment agency. Its files already contain the names of many persons, other than those mentioned above, who have expressed themselves as willing or anxious to serve the country in the present emergency, each of these candidates having filled out a prescribed questionnaire setting forth his training as well as his professional or business experi-

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ence. The office, in turn, undertakes to watch the government calls with reference to applications and wherever consistent with the country's interests, to help candidates to find places in the service. The office has assisted in this way more than 1100 persons, a large percentage of whom have secured positions. Many nominations are made through the War Service Exchange, Adjutant-General's Office, Washington.

As liaison office the Military Bureau undertakes to serve as a contact point between the University and military offices and boards. It has served as headquarters for committee organizations to aid the military establishment; also as officers' headquarters for those who have desired to make use of University facilities. It has placed the volunteer services of faculty members at the disposal of military departments. The Bureau is now aiding the Adjutant-General of California in organizing committees to instruct registrants in matters of hygiene and morale; and through the coöperation of the Summer Session the Military Bureau registered and assigned more than 200 volunteer registrars for the September 12 draft. These cases indicate the duties fulfilled by the Military Bureau as a liaison agent.

Finally, the Military Bureau in coöperation with the Alumni Association is keeping war records of all alumni in service. Close touch is maintained with the American University Union in Paris, London and Rome.

REPORT OF PERSONNEL DIVISION

The following branches of the service have been supplied with men, January 10 to August 31, 1918:

Engineer Reserve Corps	130	
Ordnance Department	132	
Quartermaster Corps	21	
Infantry	112	
Artillery	193	
Navy	77	
Medical Corps	89	
Air Service	27	
Signal Corps	101	
Intelligence Service, Army and Navy	5	
Chaplains	2	
		889
Civilian:		
Red Cross	44	
Y.M.C.A.	95	
Civil Service, War Service Exchange, Women's Collegiate Section, and miscellaneous	86	
		225
Total		1114

ORDNANCE TRAINING SCHOOL

The Training School for Ordnance Field Service at Berkeley was begun in October, 1917, at the suggestion of the Ordnance Department in Washington. Its purpose was to select and to give preliminary training to men who ultimately were expected to reach the grades of non-commissioned, and in some cases, of commissioned officers in the Ordnance Service. The enrollment to the date of closing of the school was as follows: Course No. 1, nineteen; Course No. 2, thirty-two; Course No. 3, forty-five; Course No. 4, fifty.

Instruction was given by members of the Department of Economics and of the School of Jurisprudence, assisted by one commissioned and one non-commissioned officer detailed by the War Department for the purpose.

The course of study at Berkeley covered the principles of storeskeeping; calculating methods of accounting, used in connection with Army supplies; military organization; military correspondence; military law; and military courtesy. Special emphasis was laid on visits to industrial establishments in San Francisco and Oakland. One hour a day was devoted to drill.

Students were enlisted or inducted into the military forces of the United States before beginning their work at the University. At the expiration of their period of study at the University, they were assigned to an arsenal for six weeks' further training, and after this were again assigned to depot companies wherever their services were needed. From the depots the most capable ordnance sergeants were usually sent to the Officers' Training School at Camp Mead, Pennsylvania.

The time allotted for each course was six weeks. Dean H. R. Hatfield, Professor Daggett, and Lieutenant Green were in charge of the school. The school was discontinued in May, 1918, and was transferred by the War Department to Fort Hancock, Georgia.

COURSE IN MILITARY ENGINEERING

The Academic Senate has authorized a curriculum in the College of Civil Engineering leading to the degree of Bachelor of Science in Military Engineering. The formation of the course has been in the hands of the Engineering Council which has conferred with Major-General W. M. Black, Chief of Engineers of the United States Army. The completion of the proposed course would qualify the student to undergo the competitive examination for a commission in the Corps of Engineers in the United States Army, and at the same time would give him training preparatory to the practice of engineering in civil life. The curriculum differs in a number of points from the ordinary course in the College of Civil Engineering. When this is established, a student entering the College of Civil Engineering may elect his course from Railroad, Irrigation, Sanitary, or Military Engineering.

THE COLLEGE OF AGRICULTURE

On February 7, 1917, Dean Thomas Forsyth Hunt of the College of Agriculture wrote President Benj. Ide Wheeler of the University, suggesting that in the event of war, faculties and facilities of the University should be placed wholly at the service of the Federal Government, and outlining the activities which the Department of Agriculture might properly undertake, On February 13, 1917, the farm advisors and the assistant farm advisors of the state were informed that the Board of Regents had placed the resources of the University at the disposal of the several departments of the Federal Government, including those of War, Navy, and Agriculture. As will be indicated later, the advisors were directed to make a confidential report on the measures which might be undertaken within their respective counties to promote food production.

On April 8, 1917, the President of the University directed the Department of Agriculture to assist the State Council of Defense through its Committee on Resources and Food Supply, of which President Wheeler is chairman, in any manner that might be deemed necessary to further the interests of the nation.

As a result of this action, on April 10, 1917, Dean Hunt presented to the committee some fundamental considerations affecting the food supply of the United States, in which an immediate food and farm labor inquiry was recommended.[1] By direction of the Committee on Resources and Food Supply, the Department of Agriculture of the University, in coöperation with the United States Forest Service, the State Commission of Horticulture, the State Board of Health, the State Veterinarian, the State Market Director, the Sacramento Valley Development Board and the California Fruit Growers' Exchange, con-

[1] Hunt, Thomas Forsyth, Some Fundamental Considerations Affecting the Food Supply of the United States, Univ. Calif. Agr. Exp. Sta., Circ. 163, 1917.

ducted an inquiry between April 16 and 27, with hearings in fifty-five counties in California. Certain definite recommendations were made to the State Council of Defense. An extended report of this inquiry has been published, which has formed the basis for further activities.[2]

Offer of Facilities and Services

At the request of the Western Division of the United States Army, a committee of the faculty of the Department of Agriculture with R. L. Adams, Associate Professor of Agronomy, as chairman, submitted a report to the government on the University Farm as an available location for a cavalry unit of the United States Army. Statements were furnished as to the possible utilization of other resources, such as that of the plant pathology department for medical work, and the special knowledge of C. W. Woodworth, Professor in Entomology, in optics, as bearing on the manufacture of field glasses. A detailed report was also made to the War Department on the military training of the members of the Department of Agriculture since one hundred and eleven of its one hundred and forty-seven members had undergone some military training.

Utilization of High School Boys and Girls

On May 12, 1917, Dean Hunt submitted to a joint meeting of the Committee on Resources and Food Supply of the State Council of Defense, and a committee of the State Board of Education, a plan for the mobilization of high school boys and girls for agricultural and other industrial work. This resulted in the active coöperation of Mr. Will C. Wood, representing the State Board of Education, and Mr. E. M. Cox, representing the school principals of the state. Under their direction a canvass of a portion of the

[2] Ann. Rep. Coll. Agr. and Agr. Exp. Sta., Univ. Calif., pp. 39–95, 1917.

high schools of the state was made in June, 1917, 3300 boys and 2400 girls being listed as available for agricultural or other industrial work. During April, 1918, a list of all available boys and girls in the high schools was made and all boys of high school age, not in high schools, were urged to enlist in this boys' working reserve.

In order to attain as large an acreage of crops as possible, ten members of the faculty were sent out during the first two weeks of May, 1917, to canvass all the high schools of the state and call upon boys living on farms to join the agriculture clubs as war members in order to grow crops for their own profit and for the nation's benefit. In twelve days all of the high schools of the state except those located in large cities were canvassed by the following: S. S. Rogers, Associate Professor of Olericulture; J. I. Thompson, Assistant Professor of Animal Husbandry; R. S. Vaile, Assistant Professor of Orchard Management; G. W. Hendry, Assistant Professor of Agronomy; A. W. Christie, Instructor in Agricultural Chemistry; J. C. Martin, Assistant in Agricultural Chemistry; I. F. Davis, Instructor in Agricultural Extension; W. R. Ralston, Assistant in Agricultural Extension, and R. M. Hagen, Instructor in Agricultural Extension. Twenty-thousand boys were addressed, 998 responding by the planting of approximately 1500 acres.

In addition to this campaign, the regularly enrolled members of the agricultural clubs were asked to increase their acreage of crops. One hundred and eighty-five boys responded by planting 600 acres. Thus 2100 acres were planted by the boys to war crops, in addition to the regular acreage grown every year by agricultural club members on a contest basis.

Farm Labor Organization

That an acute farm labor situation might arise was early anticipated. In May, 1917, a plan was outlined by which Professor R. L. Adams of the Department of Agriculture would be jointly employed by the United States

Department of Agriculture and the University of California as farm help specialist, and that through the Committee on Resources and Food Supply he should represent the State Council of Defense in its farm labor activities. Immediately, steps were taken to bring together all the agencies dealing with farm labor. To that end a public meeting was held at the University in Berkeley on May 31, 1917, at which a thorough discussion of the labor situation took place.

Discussion of the Problem

On June 15 and 16, 1917, five sessions of the staff of the Department of Agriculture were held, at which time an attempt was made to anticipate the war emergency activities of the staff. Committees were appointed and duties assigned to the various members. Careful consideration was given to the character of all investigational work in progress, to the end that long-time projects of a fundamental character might be continued. Projects of a more temporary or less fundamental character gave way to war emergency investigations or agricultural extension work. About fifty new food production projects developed by war necessities have been started.

Coöperation with Other Agencies

In various ways members of the staff of the Department of Agriculture have been brought into active coöperation with the Federal Food Administration for California.[3] Dean Hunt has been chairman of its Agricultural Production Board, consisting of about one hundred and fifty farmers drawn from all parts of California, and chairman of the District Milk Commission of the United States Food Administration. The commission passed upon the price of milk

[3] Ralph P. Merritt, Comptroller of the University, has been granted leave of absence from the University to serve as Federal Food Administrator for California, in which capacity he has been engaged since the organization of the Food Administration.

which the producers should receive from the distributors and which the distributors should charge the consumers during the three months, January to March, 1918, inclusive. Dean H. E. Van Norman of the University Farm School and Professor of Dairy Management, is executive secretary of this commission. Gordon H. True, Professor of Animal Husbandry, is chairman of the Livestock Commission of the Federal Food Administration for California. The Livestock Commission through conferences with meat packers of the Pacific Coast, secured an agreement to a minimum price for hogs one cent under the Chicago market for the same date, and has performed other services of an important nature in connection with the livestock situation. The University's Department of Agriculture has thus been the representative of three agencies in matters concerning ing food production in California, viz., the United States Department of Agriculture, the United States Food Administration and the State Council of Defense, simultaneously occupying a status of its own which has no necessary relation to any of them. The policy in California has been to coördinate all these agencies by means of interlocking committees so that the allied forces could more readily work to a common end. In this regard California has been measurably successful. It has been freely recognized that personal and institutional interests must be set aside for the larger interest.

Permanent Organization

It is somewhat difficult to chronicle the war activities of the Department of Agriculture, because these activities are interwoven with its research and instructional work, and because many of the activities which may now be considered war emergency work were a part of the normal activities of the organization. To increase the production of food is, certainly, one of the functions, perhaps the chief function, of the department in peace times. Its war activ-

ities are, therefore, a matter of emphasis rather than a change from its permanent function.

For example, when war was declared, only twenty counties had organized with farm advisors. Anticipating funds from the Federal Government for additional farm advisors, which became available in September, the Department of Agriculture decided in June to attempt the organization of nineteen additional counties, using its own funds for expenses and contributing the services of nineteen members of the staff of the department for this purpose. Men were thus transferred from investigational and instructional work to promote more directly the increased production of food.

Vocational Agricultural Instruction

It is part of the regular work of the farmers' short courses to give instruction in operating gas tractors. This year special emphasis was placed upon this instruction on account of the need of tractor operators, an additional course being given at the Citrus Experiment Station and Graduate School of Tropical Agriculture at Riverside. During the year approximately 500 persons have been given instruction in operating tractors. By correspondence and otherwise, the department has sought to meet requests for tractor operators and to promote more efficient use of the existing tractors. To this end, a tractor and implement demonstration was held under the auspices of the California Tractor and Implement Association at the University Farm, Davis, April 17 to 19, 1918, inclusive, in which J. B. Davidson, Professor of Agricultural Engineering, took the leading part. The attendance during the three days was estimated at 45,000 persons.

While the College of Agriculture has been for years preparing students to teach agriculture in the secondary schools, the passage of the Smith-Hughes Vocational Educational Bill, combined with the war and the request of

the State Board of Education, has led to the organization of an entirely new programme of instruction at the University Farm. This instruction is now occupying a considerable portion of the time of several members of the staff.

Conferences

There have been many meetings and conferences, some of which may properly be chronicled as war activities because of the common impulse to make every agency contribute towards winning the war. An example might be cited in the meeting of the Plant Pathology War Emergency Board held in Agriculture Hall, Berkeley, on March 30, 1918. Twenty-nine plant pathologists and scientists in related fields were present. War activities for plant pathologists were discussed in this session in which a leading part was taken by eight members of the staff of the department.

Personnel

Thomas Forsyth Hunt, Professor of Agriculture, Director of the Agricultural Experiment Station, and Dean of the College of Agriculture, is acting chairman of the Committee of Research and Food Supply of the State Council of Defense, J. E. Coit, Professor of Citriculture, J. W. Nelson, Assistant Professor of Soil Technology and member of the subcommittee on Occupational Selection of the Pacific Coast Research Conference, E. O. Essig, Assistant Professor of Entomology, and R. W. Hodgson, Instructor in Citriculture, have been transferred to farm advisor work for the duration of the war, while W. T. Horne, Associate Professor of Plant Pathology, has taken up the field study of certain diseases of deciduous fruits, of special importance in army rations.

Professor Vaile has entered the Armenian and Syrian Relief Service. P. L. Lantz, Assistant in Agricultural

Extension, entered the military service January 18, and died of pneumonia at San Diego on March 8, 1918. Professor Davidson is chairman of the Committee on War Work of the American Society of Agricultural Engineers.

Walter Mulford, Professor of Forestry, is a member of the State Committee of the Society of American Foresters. B. H. Crocheron, Associate Professor of Agricultural Extension and State Leader of Farm Advisors, is director of the Boys' Working Reserve for California.

Elwood Mead, Professor of Rural Institutions, by virtue of an arrangement between the University and the Department of the Interior, has acted as official advisor on reclamation projects embracing about half the states of the arid region. This work has necessitated conferences with officials and farmers in Arizona, California, Idaho, Nevada and Washington, also two trips to Washington, D. C., to confer with authorities of the Department of the Interior.

C. F. Shaw, Professor of Soil Technology, and W. W. Weir, Assistant Professor of Soil Technology, have been active in the Food Production Committee of the Commonwealth Club of San Francisco, the latter being chairman of the Committee on Drainage. J. W. Gregg, Professor of Landscape Gardening, has advised the commandants of Mare Island and Yerba Buena Island on the planting of trees and shrubs for screening and windbreak purposes. C. L. Roadhouse, Professor of Dairy Industry, represented the University at the World's Food Conference in Philadelphia, September 14 and 15, 1917, held under the auspices of the American Academy of Political and Social Science. E. R. de Ong, Instructor in Entomology, is one of the consulting entomologists of the Federal Food Administration for California, *vice* Professor Essig, who was transferred to field service. J. S. Burd, Professor of Agricultural Chemistry, is a member of the Board of Legal Advisors for Exemption District No. 2 of Berkeley.

W. H. Dore, Assistant Chemist in Fertilizer Control, is aiding the Preparedness Committee of the United States

Naval Construction Board, collecting information for an industrial inventory of local manufacturing resources. J. C. Marquart, Assistant in Dairy Husbandry, is representing the Dairy Division of the United States Department of Agriculture, and is inspecting the butter being supplied by Navy contractors. D. E. Martin, Assistant in Agricultural Extension, is Assistant Farm Advisor, State Relations Service.

The following twenty members of the staff are on war leave to enter the military service of the Government:

Donald Bruce, Assistant Professor of Forestry.
R. E. Clausen, Assistant Professor of Genetics.
C. M. Haring, Professor of Veterinary Science.
W. B. Herms, Associate Professor of Parasitology.
D. T. Mason, Professor of Forestry.
H. A. Mattill, Assistant Professor of Nutrition.
E. C. Voorhies, Assistant Professor of Animal Husbandry.
C. V. Castle, Instructor in Animal Husbandry.
W. T. Clow, Assistant in Animal Husbandry.
D. B. Cohen, Assistant in Olericulture.
P. I. Dougherty, Assistant in Agricultural Extension.
L. D. Hazeltine, Assistant in Agricultural Extension.
V. W. Hoffman, Assistant in Pomology.
F. T. Murphy, Assistant in Agricultural Extension.
A. N. Nathan, Assistant in Agricultural Extension.
W. D. Norton, Assistant in Agricultural Extension.
F. W. Nunemacher, Office Assistant.
A. F. Swain, Assistant in Entomology.
H. A. Wadsworth, Assistant in Irrigation.
H. H. Yost, Instructor in Agronomy.

Publications

During the twelve months dealt with in this recital the Department of Agriculture and Agricultural Experiment Station have published fourteen bulletins, thirty-nine circulars, and fifty numbered emergency leaflets. Most of these publications deal with subjects relating to the increasing of food production; many have been published to answer specific questions or promote programmes of immediate

national interest. They cover almost every phase of food production and preservation which has arisen out of the war. Altogether, during the year, there have been distributed 26,402,000 pages of printed matter.[4]

Special Courses and Lectures

In addition to special courses in poultry husbandry, dairying, and food canning and preservation, given to home demonstrators and others expecting to practice or give instruction in these matters, a laboratory and demonstration course was given at Berkeley by the Division of Viticulture in the practical details of food preservation to students who were properly prepared and who expected to make use of the knowledge during the summer. F. T. Bioletti, Professor of Viticulture and Enology; J. R. Zion, Assistant in Viticulture, and E. A. Way, Field Assistant in Viticulture, gave during the year sixty-two demonstrations to grape growers in fifteen counties. Twenty-six demonstrations of methods of food preservation were given by W. V. Cruess, Assistant Professor of Zymology, in thirteen counties, and three demonstrations to olive growers by Professor Bioletti in two counties.

The total attendance was 4396. The number of inquiries during the year by letter, telephone and personal visit has been exceedingly large. In the main office of the Division of Extension alone, more than 30,000 letters have been written, while the total number of letters written by members of the staff of the Department of Agriculture, not including farm advisors and agricultural club leaders, has been during the year approximately 120,000. The majority of the inquiries deal directly with the production of food and its preservation. Many calls have been received for assistance in controlling insect pests, fungus diseases and

[4] Complete lists of these publications may be found in the Annual Reports of the College of Agriculture and Agricultural Experiment Station, University of California.

rodents. A considerable number of requests for the investigation of property to ascertain its agricultural value have been received. Land which has never produced, or which has for a period been unproductive, is now yielding a food product.

During the Christmas recess a special short course for veterinarians was held at Davis, in which surgery of the army horse and the prevention of blackleg and anthrax, two diseases causing serious losses in cattle in this state, were the principal subjects of discussion. Eighty-seven veterinarians attended; a number of them have since entered the veterinary reserve camps of the United States Army.

A training course for machine milkers—the first ever arranged by a public institution—was conducted at the University Farm, April 1 to 12, 1918, for the purpose of ameliorating in a measure the growing difficulty of securing efficient hand milkers on dairy ranches.

Agricultural Preparedness Train

Through a coöperative arrangement between the Salt Lake Railroad and the Experiment Stations of Utah, Nevada, and California a special Agricultural Preparedness Train was run over the Salt Lake Route from Sandy, Utah, to Los Angeles, California, during the month of May, 1917. The Agricultural Experiment Station of California furnished the exhibits for two cars—one having a very complete display of commercial varieties of beans, the other showing various forage crops. Two members of the station staff accompanied the exhibits, explaining to inquirers the variety or varieties best suited to certain localities or to types of soil, and offering suggestions as to methods of culture.

Farm Labor

During the crop season of 1917 careful inquiries were conducted into the farm labor situation under the direction of Professor R. L. Adams, to determine actual conditions, contributing causes and possible remedies.[5] Early in December, 1917, a plan of operation based on the experiences of this and other states was prepared for the guidance of those investigating farm labor problems. This plan embraced as its important features the following:

1. The recognition of the fact that men engaged in unnecessary industries in the cities, women, and high school students, constitute a potential source of farm labor.

2. The reorganization and extension of existing public employment agencies to a point at which a larger utilization of all forms of labor would be more efficiently distributed.

3. To reinforce the chief provision of this plan, it was necessary to have every county act as a unit in assisting in its execution, with the county farm advisor serving as the central agency for each county; the mobilization of women and high school students as aids in the farm labor situation, constituting the tasks of the California Industrial Welfare Commission and the State Board of Education.

This plan has been carried out and many of its details comprise the present basis of procedure.

Looking beyond the possibility of the state's labor supply, potential and actual, the plan further provided for the consideration of the proposal for the importation of foreign labor provided the federal agencies for labor supply were unable adequately to add to the state's supply.

Accompanying the execution of the provisions of the plan, a careful inquiry was conducted during February and March to determine the probable farm labor needs and supplies for 1918, which resulted in showing a shortage of labor above the visible supply for every month. This is indicated in the following table:

[5] Univ. Calif. Agr. Exp. Sta., Circ. 193.

Month	Needs other than sugar beets	Sugar beet needs	Total needs
April	1,150	3,000	4,150
May	3,400	3,000	6,400
June	6,375	1,000	7,375
July	8,475	.....	8,475
August	9,025	3,000	12,025
September	9,450	3,000	12,450
October	6,875	3,000	9,875
November	2,750	.....	2,750
December	800	.....	800

These figures were based on normal conditions. Necessarily, a reduction which may be considerable, must result from the deficient rainfall, north winds and substitution of crops demanding less man power, all contributing to a very much smaller agricultural production for 1918 than that anticipated during the winter.

Before the execution of the general plan it became evident that, regardless of other considerations, there were certain classes of work in connection with this year's harvest for which it would be essential to obtain foreign labor —under existing conditions, Mexican.

Special efforts have been made to render federal regulations governing the importation of Mexican labor less stringent. Attempts were made to resort to the original regulations so that railroads could return to free importation of Mexicans and so afford the farmers an added supply of labor for their needs. These attempts failed, and since, under existing federal restrictions, free movement of Mexicans to the United States is not possible, arrangements were made with the California and Colorado Agricultural Labor Association for importation of Mexicans to be used by other individuals or formers under existing farm labor regulations. This arrangement permits economy in importation since Mexicans can now be obtained only under written agreement with the United States Government, for employment solely in agriculture.

Much work has been necessary to maintain a friendly attitude on the part of Mexican officials both in California and in Mexico.

A study of man labor cost of production, to serve as a basis for determining wage standards, was made in January, based on usual crop yields of twenty different crops. As a general result of this investigation it was found that due to high prices of essential farm products, wages might exceed considerably those of normal times—perhaps even be doubled—and still permit of profit.

As a result of special efforts constantly being made to bring about a clearer understanding on the part of the district exemption boards as to California's labor needs and as to what constitutes agricultural labor, it is felt that a larger share of bona fide farm labor will be given deferred classification.

Other activities of the office of the farm help specialist have included actual placement of labor, the establishment of a school for labor at the University Farm, search for additional sources of labor, and mobilization of certain heretofore untapped sources. The University has constantly coöperated with the following organizations: the Commission of Immigration and Housing, the California Industrial Welfare Commission, the Farmers' Committee of the State Council of Defense, the Women's Land Army of America, the Attorney-General's Office (in draft work), the Y. M. C. A., the Boy Scouts, and the State Board of Education; it has also been closely associated with the operations of such private concerns as the Valley Fruit Growers' Association, the California and Colorado Labor Association, the Imperial Valley Labor Association, the California Federation of Farmers, coöperative market associations, and with various public, private, and social committees appointed to consider the farm labor problem.

Activities of Farm Advisors

At the beginning of the war, there were fifteen farm advisors at work. Without propaganda, counties had qualified as fast as funds were available. Apparently there were ample grounds for the expectation that by 1922 all agricultural counties of California would have adopted this system which would gradually have spread over the state during a period of ten years. By February, 1917, it became apparent that war was imminent. Obviously food would be a primary consideration. The farm advisors, therefore, began quietly to make plans for an increased production as an aid to the war, which appeared inevitable. For all counties having farm advisors, confidential surveys were made and delivered to the central office. These clearly indicated certain districts where increased production was feasible. Plans were made for wide propaganda in these districts. The six itinerant assistant farm advisors were quietly moved into these sections to aid the farm advisors when the situation should develop. The outbreak of war in April, therefore, did not find the farm advisor system wholly unprepared in those counties in which men had already been appointed.

However, a large proportion of the agricultural regions of the state did not have farm advisors or farm bureaus. Neither were there funds to pay additional men had they been available. But no sooner had war been declared than the necessity for an increased food supply began to loom large among the war measures. The work done by farm advisors (or county agents, as they are sometimes called) had apparently been so successful in various parts of the country that a general demand arose that their number be increased to supply every agricultural county with such an officer. In most states, councils of defense placed the plan among their proposals and a bill quickly followed in Congress to that end. By September, legislation had been passed appropriating more than $4,000,000 for this purpose

for the current fiscal year, of which California was allotted $78,000 through the United States Department of Agriculture. Thus it became necessary to organize in a few months a system, the growth of which normally would cover five years.

There apeared to be thirty-nine counties in California where farm advisors would be most valuable. Of these, twenty had already qualified; all but one of the twenty had farm advisors at work. In order to bring the matter to the attention of the people of the other counties, nineteen members of the staff of the Department of Agriculture volunteered, each to stand sponsor for the campaign in one county. The plan was put before the people of the state at a meeting called by the Governor, as the Chairman of the State Council of Defense, at the capitol at Sacramento on September 10 and 11, to which were invited the entire State Council of Defense, the chairmen of the county councils of defense, the chairmen of county boards of supervisors and certain representatives of the Department of Agriculture. Not the least interesting feature of the meeting was the testimony given in brief addresses by the presidents of the farm bureaus on the value of the work in the counties already established.

The plan also contemplated the appointment of a large number of assistant farm advisors in order not only to extend, but to intensify the work. These assistants were to be distributed on a basis of the number of farms in the county. All counties having more than 1500 farms were to be entitled to an assistant provided the expenses of $1000 per year were met by the board of supervisors. Larger counties were to be given additional assistants on a basis of one assistant to each additional 1500 farms.

By May 1, 1918, work had progressed far in the organization of the nineteen new counties: eleven counties had their farm bureaus completely formed, their appropriations from the boards of supervisors, and their farm advisors appointed; two other counties had their farm bureaus

formed and the appropriations made; three counties had their farm bureaus formed and their appropriations pending before the supervisors; only three of the nineteen counties were lagging in the campaign through the apparent indifferenee of the people.

Defense Programme of the Farm Bureaus for 1917

During 1917, soon after the beginning of the war, every farm bureau in California voted to transfer its activities from its past regular programme to one aimed primarily toward the aid of the National Defense. Every county adopted a defense programme, the main features of which were:

I. The entire membership of the Farm Bureau should constitute a defense department with a committee of five members in charge, appointed by the president. Of this committee, there should be four subcommittees on (1) production, (2) labor supply, (3) financial assistance, and (4) the conservation of food and the elimination of waste. Each one of these, it was planned, would be directed by a member of the executive commitee of the defense department.

II. The programme contemplated: (1) the abandonment of all activities of the farm bureaus which did not bear directly upon the winning of the war, except those activities necessary to the fundamental organization; (2) the inauguration of certain new projects for 1917, which the farm bureaus would endeavor to carry on with all possible energy. While these projects varied in the different counties, the list generally followed for the 1917 season was as follows:

1. Labor survey.
2. Increase in acreage of grain sorghums.
3. Increase in acreage of beans.
4. Increase in acreage of irrigated lands by pumping plants, etc.
5. Increase in number of brood sows kept on general farms.
6. Increase in number of small flocks of poultry kept on general farms.

7. Increase in number of vegetable gardens for home use on general farms.
8. Increase in number of boys registered in agricultural clubs as war members.
9. Financial survey of the county for funds needed for increased cropping.
10. Campaign for the increase of home canning.
11. Silo campaign for the better use of forage crops.

III. While in the past the farm advisors answered all requests to call on farmers and to give advice on matters whether of importance or not, it was decided that so long as the war lasted, the farm advisors would attempt through their local directors to determine which matters would be of the most service in the national campaign. It was recognized that during the war there would be an added burden of many new projects and that every farm advisor's office would be overwhelmed with the amount of work it was called upon to carry.

Increase in the Acreage of Grain Sorghums

The fact that grain sorghums have a wide adaptability, grow with a relatively small amount of moisture and may be planted comparatively late in the season, made this project one of the most important undertaken by the farm bureaus in the early summer. The nineteen county farm advisors believe that their campaigns increased the crop 29,918 acres. There was a general difficulty in obtaining good seed, however, and during the late fall the second state-wide project was adopted whereby each farm bureau center selected within the community one or more fields which were of the best and most uniform type and from these selected enough heads to supply the entire farm bureau center for its planting in the spring and summer of 1918. Generally, the grain sorghums throughout the state have been so successful as an immediate aid to the food problem that a wide expansion is certain during the next few years.

Increase in the Acreage of Wheat

The national government decided that it was necessary for America to raise a billion bushels of wheat in 1918. Therefore, a quota was assigned each state by which it should increase its product. This increase required about 80,000 acres from California. The farm advisors adopted a uniform plan whereby they contemplated making farm-to-farm canvasses of those sections of their counties which might grow wheat instead of barley, proposing to the barley farmers that they should transfer one-tenth of their barley acreage into wheat. This, it was known, would more than make up the quota required. The call upon the farmers to raise wheat was not made because it might be a money-making project, but because the necessities of the nation required it. The farm advisors took no responsibility for the subsequent financial outcome. Since, however, the price of wheat for 1918 was guaranteed by an Act of Congress, and since the price of barley was still an open question, many farmers, upon their own initiative, have undertaken to plant wheat, and have planted an increased acreage. In most counties, the original plan for a farm-to-farm canvass was carried out, with the result that practically all counties exceeded their quotas.

Increase in Acreage of Beans

As an aid to the meat supply, beans, which are high in protein and which net a large money return per acre where they can be successfully grown, form one of the most promising annual crops. The farm advisors report that in their counties the acreage was increased 14,264 acres as a result of the high prices and of the programme of publicity into which the farm bureaus entered. Because bean culture has become more thoroughly established over a wider area than heretofore, it is generally believed it will become one of the leading agricultural industries of the state. California produced the largest acreage and yield of dry, edible beans

in its history. It not only took first place among the states in acreage and yield, but produced 46 per cent of all the beans raised in the United States. A very exhaustive study of varieties and their adaptations and culture was made by Professor Hendry.[6]

Other Measurable Results

Labor	
Applications received by farm advisors or farm bureaus for farm or household labor	3,830
Laborers supplied through farm advisors or farm bureaus,	
Male	2,989
Female	1,326
Laborers supplied from agencies,	
Male	1,060
Female	667
Crop production campaigns	
Farmers assisted in securing grain sorghum seed	399
Bushels of seed secured	973
Acres of grain sorghums seeded as result of production campaign	29,918
Estimated yield of additional acres in bushels	188,940
Farmers assisted in securing Sudan grass seed	211
Number of bushels of Sudan grass seed secured	186
Acres of Sudan grass resulting from special campaign	1,283
Estimated yield of Sudan grass in bushels	2,769
Farmers assisted in securing winter wheat seed	279
Bushels of winter wheat seed secured or located for farmers	33,237
Acres of winter wheat planted as result of special campaign	101,470
Farmers assisted in securing seed rye	66
Bushels of rye seed secured for farmers	158
Acres seeded as a result of special campaign	393
Farmers assisted in securing barley seed	22
Bushels of barley seed secured for farmers	3,895
Acres of barley seeded as a result of special campaign	1,650
Number of farmers assisted in securing seed potatoes	180
Bushels of seed potatoes secured for farmers	3,190
Acres of potatoes seeded as a result of special campaign	1,461
Estimated yield of additional acres in bushels	127,700

[6] Hendry, G. W., Bean Culture in California, *ibid.*, Bull. 294.

Number of farmers assisted in securing seed beans	379
Number of bushels of seed beans secured for farmers	1,439
Acres of beans seeded as a result of special campaign	14 264
Yield of additional acres of beans in bushels	215,300
Live Stock.	
Additional cows bred as a result of campaign	200
Additional sows bred as a result of campaign	290
Additional sheep placed on farms	7,530
Food Conservation	
Persons assisted in home garden work	7,222
Farmers given information for storing plants and vegetables	15,001
Quarts of fruits and vegetables canned by adults	41,450
Canning demonstrations held for women	102
Pounds of fruits and vegetables dried as a result of campaign	125,000
Miscellaneous	
Crops saved by fire protection	$130,000
Crops saved by grasshopper campaigns	$40,000
Butterfats saved by feeding demonstrations	$20,000
Farmers assisted in securing loans on tractors	88
Increased acres cultivated due to tractor campaign	6,200
Farmers assisted in securing power sprayers	48
Public markets established	11
Value of crops sold in such markets	$210,000

Defense Programme of Farm Bureaus for 1918

Since the beginning of the war the number of farm bureaus organized in counties has increased from seventeen to thirty-six. Of these, thirty-one counties have farm advisors installed. There are 20,000 farmers in California who annually pay a dollar to belong to the farm bureaus. The counties in the farm bureau system now cover 85 per cent of the farms of the state. For the first time it has become possible to reach the farmers of California by personal contact through a state-wide organization.

The food production campaign for 1918 was launched at a conference of the county farm bureaus in California held at Berkeley, March 11, which was attended by three representatives of each farm bureau and by the farm advisors and assistants.

President Wilson sent the following message to the conference which was received with much enthusiasm:

I am greatly interested in the emergency food-production conference to be held at Berkeley. It is highly important that we do everything within our power to secure sufficient supplies for our own population and Army and for the nations with which we are associated. I trust the conference will find ways of overcoming the difficulties inherent in the situation and that its labors will be fruitful of large results and thereby aid in bringing this war to a successful termination. May I not suggest that you read to those assembled at the conference, as a message from me, the recent statement I made to the farmers of the nation through the conference at Urbana?

The day was spent in discussion of definite detailed plans for the forthcoming season. These were summarized in a reply telegram addressed to President Wilson:

Berkeley, Cal., March 11, 1918.

The President:

The members of the emergency food production conference, representing the agricultural interests of the State through the 36 organized county farm bureaus, received your telegraphic message with great enthusiasm and have adopted the following State-wide program for the season of 1918:

1. To urge the building of a silo and planting of sweet sorghums for silage and for sirup on every dairy farm in California.

2. To put out on 20,000 farms one good brood sow or two pigs in order to increase the amount of pork that the State will raise. At least 40,000 more hogs will be so raised.

3. To develop boys' agricultural clubs in every community in California where supervision can be provided. Three thousand boys were already growing crops. Thousands more are to join from this campaign.

4. To bring the women of California who live on farms into active organization as a part of the county farm bureaus in order to increase food conservation.

5. To handle farm labor siuation by eliminating unnecessary activities and working harder on essential ones; also further better distribution of labor by means of Federal employment stations and coöperation of farm bureaus.

6. To investigate immediately the seed supply of the State in order to be assured that an adequate amount is on hand to plant the 1918 crops.

7. To protect grain fields and grass ranges from fire by means of county-wide protective organizations under farm bureaus and thus eliminate a quarter of a million dollars annual loss in foodstuffs.

Please rest assured of our hearty coöperation for the successful prosecution of the war.

B. A. Teagarden, *Chairman*,
Roger L. Rice,
J. L. Harean,
B. H. Crocheron, *State Leader*.

These campaigns are now under way and will consume the entire time and attention of the farm bureaus and farm advisors during the present year.

Agriculture Club Work

In order to increase the amount of food being produced by the agriculture club members of the state, a continuous plan of work has been outlined to keep the members active through the entire year. Each member is to carry on a livestock feeding project during the winter when few crops can be grown. In order to fit in with the increased pork production campaign the formation of pig clubs has been especially emphasized. Early spring crops, such as potatoes, follow the annual project, succeeded in turn by such summer crops as beans and sorghums. The sorghum crops will furnish grain to feed a larger number of livestock the following winter. Special clubs, i.e., sheep and lamb clubs, have been organized to conserve orphan and twin lambs which normally are slaughtered in large numbers each spring.

The number of high school teachers of agriculture, coöperatively employed as district club leaders, has been increased from fifteen to thirty-four. The enrollment has already increased from 1879 boys in 1917 to 2389 boys and girls in 1918. Thousands more will enroll for planting summer crops.

Club members, especially those enrolled in agriculture in clubs, are proving to be excellent demonstrators of the

best agricultural practices. By project feeding, pig club members are making net profits of from $5 to $10 per hog for 105 to 120 days' feeding, even with the present high prices of feeds.

Home Demonstration Work

Before the outbreak of the war three specialists were employed by the College of Agriculture for demonstration work among farm women. These traveled through the state giving advice on the conservation of farm products. With the passage of the war emergency bill for "stimulating agriculture and facilitating the distribution of products," the United States Department of Agriculture allotted $20,000 to California for demonstration work for farm and city women to be conducted through the College of Agriculture.

The state was then divided into nine districts, in each of which a woman was employed as demonstration agent. Since the bill did not pass Congress until late in August, it was October before the new appointees were at work in their districts. Four major projects occupied their main attention: (1) conservation of food by canning, drying, etc.; (2) the substitution of foods to take the place of wheat, meat, etc.; (3) the increase of home gardens on farms; and (4) the increase of small poultry flocks on farms. The demand for this type of work proved so large that the number of demonstrators was increased to eleven —as many as the funds permitted. During the year, 1342 demonstrations were given and 551 lectures delivered, or a total of almost 2000 meetings attended by 66,029 persons.

It became evident that it was impossible for a demonstrator to cover adequately several counties since the greatest efficiency of this work is achieved through personal visitation at the request of the people. It is agreed, therefore, during 1918 and 1919 to transfer the work from a district basis embracing several counties, to a plan whereby

a county home demonstrator will be placed in a single county, through the coöperation of the county board of supervisors, by the provision of a plan similar to that by which farm advisors have been installed.

In order to secure a special organization through which the home demonstrator might reach the women of the county who desire this form of service, a plan has been devised whereby farm home departments of the farm bureaus are being formed in thirty-five counties; of these, nine are already completed. Women therein join the farm bureau on the same basis as men, but are expected to be particularly interested in the work for the benefit of the farm home. Demonstration meetings for the women will be held in every farm bureau center on an established monthly schedule when women county demonstrators are installed. It is expected that through an increased appropriation by Congress to the Department of Agriculture, funds will be allotted to California during the forthcoming year for the special furtherance of this enterprise in twenty counties.

School and Home Gardens

The school and home garden work has not been actively promoted in a general state-wide campaign, the College of Agriculture having contented itself with giving advice on conditions essential to success. Its purpose has been to promote gardens only where the local conditions warrant reasonable assurance of success. Obviously, the production of food is not increased by attempts which result in failure, no matter how praiseworthy the motive. The work has largely fallen upon O. J. Kern, Assistant Professor of Agricultural Education, who has coöperated with the Red Cross organizations in giving many lectures at schools on war gardens.

Land Settlement

The State Land Settlement Board, of which Professor Elwood Mead is chairman, has acquired, prepared and subdivided for settlement about 6400 acres of land at Durham, California. More than 1000 acres were seeded, chiefly to wheat and barley. The entire area, mainly devoted to pasture, will be settled and intensively cultivated before the end of 1918. In addition to its contribution to the food supply of California, it promises to exercise a marked influence on policies to be adopted for providing homes for soldiers after the war. Professor Mead has been called to Washington for a portion of his time to carry on this important reconstruction work.

Sanitation in Military Camps

During the summer and autumn of 1917, W. B. Herms, Associate Professor of Parasitology, was almost continuously engaged in investigating the sanitation of the seventy-three camps of the Western Department of the United States Army, particularly in regard to mosquitoes and flies. This work, which is the outcome of the mosquito survey of the state, was begun in 1916, in coöperation with the State Board of Health. This important undertaking led to Professor Herm's appointment as Captain in the Sanitary Corps of the National Army. The investigation will be continued and, it is expected, completed during the coming summer by S. B. Freeborn, Assistant Professor of Entomology. Professor Freeborn has recently been commissioned First Lieutenant in the Sanitary Corps.

Fire Control

The annual loss in grain, forage and timber by fire in California is estimated to be about $750,000, approximately equally divided among the three items. When war was declared there was no effective organization for the control

of fires outside the national forests and national parks. The situation was discussed at a forestry meeting held October 13, 1917, in connection with the dedication of Hilgard Hall at the University. At this meeting the Forest Industrial Committee was formed, at the suggestion of the Division of Forestry. The committee consists of the State Forester, chairman, one representative each of the United States Forest Service and the Division of Forestry of the University of California and three representatives of the lumber industry. This committee has been the largest factor in securing unity of thought and action on the part of organizations interested in fire protection. It has actively conducted a state-wide campaign for better fire protection of the grain fields and grazing ranges. The four leading tractor and harvester manufacturers of the state have perfected adequate safety devices which have been tested by the Division of Agricultural Engineering. In various effective ways Woodbridge Metcalf, Assistant Professor of Forestry, has given much of his time to the study and promotion of methods of fire protection.

Fish Investigations

The Committee on Resources and Food Supply of the State Council of Defense, on April 10, 1917, directed the College of Agriculture to report upon sources and supply of fish in California. This the College of Agriculture was enabled to do, through E. J. Lea, Associate Professor of Nutrition and Head of the Food Laboratory of the State Board of Health, on May 10, 1917. The subsequent assignment of Dr. E. D. Clark, trained investigator in this problem, by the Bureau of Chemistry of the United States Department of Agriculture to the Federal Food Administration for California made it unnecessary to continue further investigations. Dr. Clark was assisted in obtaining two trained men, and they have since used the laboratory of the Division of Viticulture.

Grasshopper Control

During the summer of 1917, the Division of Entomology made a grasshopper survey of the state in order to locate the breeding grounds of that insect. As a result of an extensive examination, county farm advisors, county horticultural commissioners and interested private individuals were instructed as to the possible danger of grasshopper attacks and the localities in which these attacks might arise. In addition, many demonstrations were made in the districts concerned. At the request of the United States Forest Service, the Division agreed to coöperate in the control of grasshoppers on the stock ranges of the Plumas and Lassen National Forests during the summer.

Bacillus botulinus

The *Bacillus botulinus* has caused at least nine deaths in California and Oregon during the past year, where improperly sterilized fruits and vegetables have been used. The Division of Viticulture has studied the death temperature of the organism under various conditions and has issued a brief statement. The usual methods of home canning have so far appeared to be safe.[7]

Utilization of Garbage

The utilization of city garbage as food for swine, as a war emergency product, has been thoroughly investigated by the Division of Veterinary Science. Four members of the staff have been engaged in the work. It was found that many of the cities of California, including such large municipalities as Oakland and San Francisco, were destroying a considerable part of this valuable hog food. Experiments were carried on in collecting the garbage from twenty-four families of ordinary means in the city of Oakland, from June, 1917 to January, 1918, and feeding it to hogs. The

[7] Cruess, W. V., Home and Farm Canning, *ibid.*, Circ. 158.

experiment showed that twenty-six pounds of "residence garbage" would produce one pound of live pork. At this rate there was being destroyed in the bay cities enough hog food to produce 1 per cent of the total food supply of the population of these cities. This waste material has gradually been utilized until during the month of April, 1918, the City Engineer of Berkeley estimated that 400 tons of green garbage collected in that city was fed to hogs.

Serums and Vaccines

Garbage feeders invariably lost a high percentage of their pigs soon after weaning, which at times reached 50 per cent or more. All garbage feeders in the bay vicinity were visited on several occasions by various members of the staff and advised of the proper method of prevention of this loss by use of anti-hog-cholera serum. At present the loss from this cause in garbage fed hogs practically has been eliminated. Anti-hog-cholera serum has been manufactured and distributed in as large quantities as in the past, but more has been personally administered by members of the staff with uniformly successful results. Investigations of chicken diseases have continued and during the spring of 1918 a larger amount of chicken-pox vaccine was distributed than ever before, with highly successful results.

Nitrogen Fixation

The problem of nitrogen fixation was assigned to the Division of Soil Chemistry and Bacteriology at the special request of the Committee on Sources of Nitrogen of the Council of National Defense, of which Mr. F. G. Cottrell of the United States Bureau of Mines is chairman. The committee asked for the transfer of C. B. Lipman, Professor of Soil Chemistry and Bacteriology, to Washington to study this special phase of the problem. It was finally decided, however, that the work could be just as effectively done as a part of the activities of this station. The object

is to determine whether the total and available nitrogen for plants could not be increased by the proper supply of energy to the soil and through other technical methods. The project is now well under way and, it is believed, for the first time the problem of nitrogen fixation by soil organisms has been studied, employing all possible safeguards against error required by the modern appreciation of statistical and physical chemical methods.

Stored Grains

The College of Agriculture was represented on a committee with Professor Doane of Leland Stanford, Jr., University to assist the Food Administration in the preservation of foodstuffs. Inspections have been made of the larger warehouses of the San Francisco Bay region, Southern California, and the San Joaquin and Sacramento valleys to determine what insects are present and the possibility of injury. Wherever losses were noted in any foodstuffs the attention of the warehouse man in charge was called to the fact and through him word was sent to the owner of the goods with recommendations for control measures. When possible, assistance has been given in practical control work, such as directions for the building of fumigating houses, practice of fumigation and in the use of insecticidal washes.

Economic Poisons

It is estimated that the agriculturists of the state paid out approximately two and a half million dollars during 1916 in the purchase of materials for the control of pests. Steps were taken by G. P. Gray, Assistant Professor of Entomology and Chemist in the Insecticide Laboratory, to ascertain whether acute shortages were apt to occur in the future and whether in some cases it might be desirable to substitute cheaper materials for the more expensive. It was concluded that there is no actual shortage of arsenic

in the United States, the high price of this important economic poison being artificial, and that conditions in respect to copper sulphate, sodium cyanide and carbon bisulphide are as good as could be expected under the circumstances, but that an actual shortage of sulphur may occur.[8]

Squirrel Campaign

The College of Agriculture has been coöperating with the State Commission of Horticulture in a state-wide campaign against the ground squirrel and other rodents whose depredations cause vast losses in food products. In this work the College of Agriculture has been assisted by the Museum of Vertebrate Zoology of the University, which has prepared two important publications.[9] M. R. Miller, Assistant Chemist in Insecticide Control, has analyzed the more important brands of commercial rodent poisons. A great variation in poison content was found. The results which have been published will, it is believed, cause the standardization of rodent poisons.[10] A promising new method of squirrel extermination has been developed by Professors J. S. Burd and G. R. Stewart of the Division of Agricultural Chemistry in their investigation of fumigation methods.

Potash

Although started prior to the war, the Division of Agricultural Chemistry has carried on an extensive study of kelp with particular reference to the production of potash. Eight publications have been issued, which it is believed, have been useful in the development of the local potash industry. Investigations have also been made, and the

[8] California State Commission of Horticulture, Monthly Bulletin, March, 1918.

[9] Dixon, Joseph, Control of the California Ground Squirrel, Univ. Calif. Agr. Exp. Sta., Circ., 181; Control of the Pocket Gopher in California, *ibid.*, Bull. 281.

[10] Calif. St. Comm. Hort., Mon. Bull., April, 1918.

results published, on the possibility of tule as a source of potash.[11]

Cotton

In the summer of 1917 the War Department emphasized to the United States Department of Agriculture the necessity of increasing the supply of long staple cotton for its programme of aeroplane manufacture. Experiments had already been conducted by the Division of Agronomy at the Kearney Ranch, Fresno, in recognition of the importance of this crop.[12] On October 19, 1917, a preliminary meeting was held in Fresno under the auspices of the Farm Bureau to which all farmers interested in the planting of cotton were invited. More than one hundred attended this meeting, at which the salient facts of cotton production were presented and the desirability of growing this staple in the San Joaquin Valley set forth. A committee was appointed to organize a permanent cotton growers' association and to secure for prospective growers a supply of good Egyptian seed. Other meetings have been held from time to time, until now it seems that at least 6000 acres of this type of cotton will be planted in the southern San Joaquin counties. On February 14, 1918, a conference on the subject of cotton was held at Holtville. It is believed that 10,000 acres will be planted in the Imperial Valley the coming season as compared with 1000 acres planted last year.

Substitutes for Sugar

Between October, 1917 and May, 1918, G. A. Coleman, Instructor in Entomology, arranged the programmes and attended forty-three meetings for beekeepers in coöperation with Messrs. E. F. Atwater and G. S. Demuth of the United States Department of Agriculture. Sixteen counties in

[11] Hibbard, P. L., Potash from Tule and the Fertilizer Value of Certain Marsh Plants, Univ. Calif. Agr. Exp. Sta., Bull. 288.

[12] Gilmore, J. W., Cotton in the San Joaquin Valley, *ibid.*, Circ. 192.

middle and southern California were covered by these meetings, which were attended by 1500 people. A partial bee range survey has been made of Santa Barbara and Monterey National Forests. Maps of locations and description of ranges for 6000 colonies of bees have been prepared from this survey. A complete survey has been made of Santa Cruz County showing favorable locations for 10,000 colonies of bees with a possible annual production of 2,000,000 pounds of honey.

A campaign, mentioned elsewhere, to increase the possible supply of sugar by growing sweet sorghums has been undertaken. Professor W. V. Cruess has made a special investigation of the practical methods of producing sorghum sirup, while B. A. Madson, Assistant Professor of Agronomy, has reported upon the investigation of several years concerning varieties and culture of sweet sorghums.[13] Investigations by the Division of Viticulture have proved that grape juice may be cheaply and successfully preserved with sulphurous acid until it can be transferred to a central point for sirup manufacture, and that the sulphurous acid can be completely removed and a very palatable sirup, suitable for cooking and table use, made from the juice with calcium tartrate as a by-product.

Vegetable Preservation

The home drying, salting and pickling of vegetables have been investigated and the results used as a basis for several publications. The commercial drying of vegetables is now being studied and has resulted in interesting several companies in drying vegetables for the War Department. Professor Cruess has actively coöperated with the members of the Subsistence Division of the Quartermaster Corps of the United States Army. The lemon juice method for the home canning of vegetables has been further tested during the past season and previous conclusions as to its reliability confirmed.

[13] Madson, B. A., Sweet Sorghum for Forage, *ibid.*, Bull. 293.

Wheat Production Conference

On August 27, 1917, Professor J. W. Gilmore attended a conference held under the auspices of the United States Department of Agriculture in Spokane, as a representative of the College of Agriculture, to consider with representatives of other mountain and coast states the methods of increasing wheat production. Subsequently a programme for increasing the production of wheat was laid out in California; first, by increasing acreage and, second, by increasing the yield per acre. Three general methods of increasing acreage were decided upon: further use of idle lands, irrigation of lands not otherwise suited to the growing of wheat, and by requesting farmers to substitute 10 per cent of the barley acreage for patriotic reasons. The increase of yield on existing acreage is to be brought about by better seed, more thorough preparation of the soil, greater care in seeding promptly and the application of fertilizers.

In response to a publicity campaign there was listed with the Division of Soil Technology 32,552 acres by owners and 39,000 acres by agents of owners. In addition, there were reported 265,850 acres by farm advisors, county horticultural commissioners, and others who were without authority to give leases or otherwise handle the land. Wherever possible to get the location and ownership of the last named tracts, they were investigated and in most cases were found to be used for pasture or other crops, or to be unsuited to production because of soil, climate or other reasons. Replies from 47 per cent of those who listed their land show that 8825 acres or 27 per cent listed by owners is now rented, and that 15,000 acres or 38 per cent listed by agents is rented. This gives a total rented of 23,825 acres, or 33⅓ per cent of the total 71,552 acres listed. No data are available regarding the land controlled by the 53 per cent of owners or agents who did not answer the letter of inquiry.

Irrigation

The assistance rendered by the Division of Irrigation Investigations to individuals and to particular enterprises has dealt mainly with increasing the irrigation of lands capable of producing grain and forage crops. A field survey of irrigation of wheat in California has been made.[14] Practical help has been given in laying out farm ditches and irrigation pipe lines, installing pumping plants and preparing land for irrigation. Twenty-five cases of this kind have been dealt with during the year, involving a total area approximating 2500 acres. As a result of a state-wide conference in Berkeley, April 17, 1917, Decision No. 4278 was obtained from the State Railroad Commission. This decision removed legal restrictions on emergency deliveries of surplus irrigation water by utility water companies. An emergency act drafted by the Water Commission and the Railroad Commission, in conference with the Division of Irrigation Investigations, removed legal restrictions from emergency deliveries of irrigation water by individuals and mutual water companies. With the assent of the State Engineer and of the Attorney-General, an appeal was sent through the State Council of Defense to irrigation districts, urging emergency irrigation deliveries to land owners outside of districts. After numerous conferences signatures were obtained to a stipulation which practically vacated, for the period of the war and a reasonable time thereafter, an injunction issued in 1903 against the opening of Lake Land flood water canal from Kings River. This waiver makes possible the watering of at least 30,000 acres. In coöperation with motor and irrigation machinery supply houses in San Francisco, a ruling was obtained from the War Priorities Board through the Federal Food Administration for California, permitting priority orders for motors, engines and pumps needed for irrigation of essential crops.

[14] Adams, F., Extending the Area of Irrigated Wheat in California for 1918, *ibid.*, Circ. 182.

Investigations were instituted, on July, 1917, of a controversy between the people of Lake County and the Yolo Water and Power Company, involving the use of water of Clear Lake for irrigation. These investigations were the basis for an agreement obtained April, 1918, by the Federal Food Administration for California, by which 10,000 acres of rice will be irrigated in Yolo County in 1918 with water pumped from Clear Lake. The agreement entered into will be supervised throughout the season by S. H. Beckett, Assistant Professor of Irrigation Practice, acting as representative of the Food Administration. A small demonstration project is under way at Redding with a view to hastening the use of water made available by Anderson-Cottonwood Irrigation District canal. A field investigation of opportunities for temporary utilization of water wasted in Auburn Ravine from the power plant of the Pacific Gas and Electric Company has been made. The water users and owners were brought together in a controversy regarding the use of Clark Ditch in El Dorado County. Assistance was given in the settlement of a controversy over distribution of irrigation water in Orangevale Colony. A preliminary financial investigation of California irrigation, drainage and reclamation enterprises, which contemplate substantial expenditures during the war period, has been made. This inquiry is for the purpose of enabling the federal authorities to report on these projects when called upon by the Capital Issues Committee of the United States War Finance Corporation.

Seed Supply

Information was widely distributed concerning the regional adaptation of six leading varieties of wheat. For many years these varieties have been under investigation by the Division of Agronomy. Arrangements were perfected whereby millers, warehouse men and grain dealers agreed to set aside for seed good stocks of the pure varieties.

This was facilitated by the United States Grain Corporation. While the plan was not wholly satisfactory much good was accomplished.

Through coöperation with the United States Department of Agriculture, Professor W. W. Mackie and several assistants promoted in many parts of the state the treating of wheat and barley by standard methods for the prevention of smut. Laboratory work has been carried on to determine the effectiveness of these treatments. The party is now engaged in following up the results through the harvest.

In the spring of 1917 and again in 1918, J. W. Gilmore, Professor of Agronomy, secured from as large a number of farms as possible, data on the amounts and kinds of seed needed for planting, and the amounts and kinds of seed on hand for sale. These data, showing lists of farmers and seed firms from which seed could readily be secured, were sent to all farm advisors. Where it was found a shortage existed, dealers were notified to supply this shortage. Although it was sometimes difficult to keep an adequate report of the amounts and kinds of seed on hand by dealers, in general the system has been successful. It has also been helpful in enabling farmers having stocks of good seed on hand to dispose of them at reasonable prices.

Cultural Methods

The investigations of the Division of Agronomy carried on at Davis, Stockton, Fresno and El Centro during the past year, as heretofore, show the influence of the thorough preparation of soil upon the yield of wheat and barley, especially during those periods when the rainfall is subnormal. Thus the grain crop of 1917 at Davis showed but little effect of the deficient rainfall, while a normal yield during 1918 is at present indicated although it is the second year of deficient rainfall. In order to bring this matter to

the attention of farmers as thoroughly as possible a Cereal Field Day was held at the University Farm at Davis on May 18, 1918.

Intercrops and Winter Cover Crops

At the University Farm, Davis, in May, 1917, feterita, dwarf milo and two varieties of beans were planted in a two-year-old and in a nine-year-old deciduous orchard. Neither of these orchards was irrigated. All of the crops made a splendid growth and produced heavily in the two-year-old orchard without any apparent injury to the trees. None of the crops made a successful growth in the nine-year-old orchard. It thus seems possible to produce a great deal of food material in young orchards without detriment to the trees, even under dry land conditions. What crops would thrive in a nine-year-old orchard if irrigation were available is being determined this summer.

Careful estimates made early in 1917 indicated that there were in southern California about 77,000 acres of young irrigated citrus orchards that might be intercropped without injury to the trees. Intercropping, especially with beans and to some extent with potatoes and grain sorghums, was advocated. A survey made later in the season by Professor R. S. Vaile indicated that while normally only 25 per cent of such groves are intercropped, this last year at least 45 per cent have been so handled. About 30,000 acres were planted to beans, 3000 to grain sorghums, 2000 to potatoes and 1000 to corn. A special study of the results obtained has been published.[15]

The investigations of the Citrus Experiment Station show that the cheapest source of nitrogen is through the use of leguminous, winter cover crops.[16] In view of the great war demand for commercial nitrogenous materials,

[15] Vaile, R. S., Intercropping of Young Irrigated Orchards, *ibid.*, Circ. 174.

[16] Metz, M. W., Green Manure Crops in Southern California, *ibid.*, Bull. 272.

the station has advocated the extensive use of such cover crops with marked results.[17] The fact brought out by the orchard trials, that potash and phosphoric acid have shown but slight effects and can therefore be omitted from citrus groves for a few years, has been emphasized.

Fruit Drying Industry

During the season of 1917, W. L. Sweet, Instructor in Pomology, and other members of the Division of Pomology conducted an inquiry into practices followed by the leading growers of deciduous fruits. Special attention was given to the cost of different operations, and the total cost of drying and curing the various deciduous fruits. This survey has made available information enabling those just engaging in the business to begin employing the best practices and also enabling many experienced growers to improve their methods.

Sugar Beets

The shortage of sugar and the known relation of curly top or blight disease of beets, caused by the bite of a leaf hopper, to the production of sugar beets throughout the western third of the United States have caused R. E. Smith, Professor of Plant Pathology, to redouble his efforts to the end that practical methods of control may be secured. H. H. Severin, Instructor in Entomology, has been relieved of all teaching and other research duties to give his whole time to the study of this destructive leaf hopper. In May, 1917, the station issued a circular of information, including estimates of cost of production which were submitted to the committee of the United States Food Administration, which also reported on the price the grower should receive for sugar beets.[18] Professor R. S. Vaile also made a special

[17] Kelley, W. P., The Fertilization of *Citrus*, *ibid.*, Circ. 171.

[18] Adams, R. L., Fundamentals of Sugar Beet Culture under California Conditions, *ibid.*, Circ. 165.

report on conditions in southern California. It was foreseen that owing to the conflict in Europe the sugar beet supply would become a more prominent question than heretofore; consequently investigations have been under way bearing upon the possibility of producing sugar beet seed in California. Promising results have been obtained. A large quantity of sugar beet mothers, or stechlings, has been obtained and trial plantings have been made at Los Alamitos, Oxnard, Arlington, Riverside, San Jacinto, Victorville, and Bishop.

Potato Production

During the winter of 1917, several conferences were held upon the outlook for potatoes during the approaching year. It was deemed inadvisable to undertake any campaign for increasing the acreage of potatoes since it seemed probable that the high prices then ruling and the general agitation for planting in home gardens would cause the supply to be maintained. As was anticipated, a sufficient supply of potatoes was produced to meet existing needs and in some localities an overproduction was apparent. Steps are now being taken to promote the production of potatoes during the season of 1918, since there is some danger of a reduced acreage due to relatively low prices which have ruled during the last few months.

Nutrition Studies

The war has occasioned, through the use of food substitutes, new demands upon the Division of Nutrition. Analyses have been made at the suggestion of the Federal Food Administration of California of burro meat, Belgian hares, bolted flour from grain sorghums and other meals offered as wheat substitutes, including barley flour and barley breakfast foods. Nutrition surveys of all state institutions have been made for the purpose of revising and regulating diets to conform to the policy of the United States Food

Administration. These surveys cover a population approximating 20,000. Every state institution is now using some preparation such as Diamalt in bread making, in place of sugar, without impairing the quality of the bread produced.

Feedstuffs for Live Stock

The incentive to adulterate feedstuffs has been brought about through their greatly increased cost. Examination of a large number of these adulterated feedstuffs has been made by the Division of Nutrition, thus preventing producers from being defrauded. Fifty individual studies of new feedstuffs, some of them involving several analyses, have been made, among which may be mentioned by-products of barley flour, condensed whey, peanut by-products, raisin seed, O. C. Meal, spinach stalks, salt bush seed, water grass seed, artichoke silage, beet top silage, bean straw silage, Egyption corn bran and middlings, buckwheat by-products, tree moss, liquid garbage, and tule grass. A circular on minor feedstuffs for domestic animals has been published.[19]

Although not a product of wide commercial importance, it has been found that buckeyes may be used for poultry and hog foods where occurring in sufficient abundance to warrant. By a simple process the bitter principle of the buckeye can be eliminated. This method consists in soaking in a solution of 1 per cent lye over night. The produce is afterwards thoroughly washed, dried and ground. Good results with poultry have been obtained when the processed material constituted 25 per cent of the mash ration.

Production of Wool

A campaign has been conducted to increase the rearing of farm flocks and to lessen the heavy losses of newly born lambs on the ranges. To this end an extended survey of

[19] Woll, F. W., Feeding Stuffs of Minor Importance, *ibid.*, Circ. 167.

sheep ranges of the state and a close study of the methods of handling sheep at lambing time were made by R. F. Miller, Assistant Professor of Animal Husbandry. A plan for a lambing shed was prepared and has been widely distributed.[20] A demonstration has been made at University Farm, Davis, which shows that old ewes with broken-down mouths may be transferred from the ranges to valley ranches, thereby increasing materially the amount of wool and mutton produced in California.

Pork Production

In order to promote the production of hogs, representative animals from experimental lots which had been fed to determine the comparative economy of heavy and light grain rations on pastures, were exhibited at the various hog raising centers of the state. These meetings were attended by one hundred and fifty-five persons. Great interest was created and lively discussions of feeding methods resulted.

Poultry Production

The College of Agriculture has been coöperating with the Federal Food Administration of California and the Bureau of Chemistry of the United States Department of Agriculture in a study of the production and marketing of poultry. In various ways, such as the publication of circulars, personal addresses, use of lantern slides and personal visitations by women home demonstrators, the College of Agriculture has sought to extend poultry raising to farms and regions where foods can be cheaply grown, and to stimulate the practice of keeping a limited number of chickens in city backyards for the purpose of utilizing garbage. Seventy sets of blueprints and specifications for farm poultry houses and backyard poultry houses, designed by the College of Agriculture, have been sent out. The use of potatoes, barley, rice and rice products has been

[20] Miller, R. F., and Fermery, G. E., Lambing Sheds, Circ. 188.

stimulated by investigations of the Division of Poultry Husbandry with a view to reducing the use of wheat. In addition to the usual short courses given at Davis and in southern California, a special course of instruction was given to the ten women demonstrators, February 11 to 15, 1918, inclusive, and another was given April 3 to May 3, 1918, inclusive, as a part of the Emergency Summer Course held at the University Farm, to prepare teachers of agriculture in the high schools in accordance with the Smith-Hughes Act.

Dairy Products

It has been shown that the amount of protein in skim milk equals that in the beef consumed in the United States. The Dairy Industry Division of the College, at the request of the United States Department of Agriculture, has sought to promote the more extensive use of cottage cheese, thus using skim milk which would otherwise be put to a less important purpose, such as the making of casein for sizing paper. In furtherance of this plan, a special course in cottage cheese making was given. A course of instruction has been outlined with a view to preparing women to fill positions as milk and cream testers in dairy establishments now employing men for this work.

Short Courses for Women

Since May 15, 1918, the College of Agriculture has established and conducted two courses for women, of four weeks' duration each, the object being to develop leaders for groups of women agricultural workers in the state. These courses were held at the University Farm at Davis. In addition, at the request of the Woman's Land Army of America, the College of Agriculture has conducted a special class for women machine milkers at the University Farm.

DEPARTMENT OF BOTANY

The Department of Botany has devoted considerable time and has expended a certain portion of its appropriations for war work, particularly as approved by the Pacific Coast Research Conference in connection with the State Council of Defense. An appropriation of $700 has been received from the Council and has been expended on investigations of the possibilities of a supply of rubber from native plants. This work has been carried out by H. M. Hall, Associate Professor of Economic Botany, and T. H. Goodspeed, Assistant Professor of Botany. Their preliminary report has been published in *Science* of May 10, 1918 (vol. 47, no. 1219, pp. 452–454) under the title, "An Emergency Supply of Rubber."

The plants investigated belong to *Chrysothamnus* and related genera. There is no well established common name for the plants but they are included in the general category of "rabbit-brush." They are sometimes also known as "golden brush." These are large plants which grow in abundance on the desert area and in the Great Basin generally. It has been found that some of the species carry 10 per cent rubber. However, those which are sufficiently common to make their utilization possible carry not more than 5 per cent.

This is not sufficient to be of interest commercially with rubber at its present price. If, however, the importations of raw rubber should be curtailed through enemy action, this emergency supply existing within the border of the continental United States could be drawn upon. While there is not enough to supply the need for even a single year, the total amount nevertheless would be considerable. The rubber obtained from these plants is of good quality, though not equalling the quality of the best imported Para. The study is to be continued in order more definitely to locate the supply of the shrub and to work out various problems in connection with harvesting.

Other minor matters under consideration by the Department of Botany, either separately or in conjunction with other departments, have reference to unused food plants either for human beings or domestic animals, such as the buckeye, in particular, or for use in industries or scientific research, such as the economic value of certain seaweeds, particularly as substitutes for agar.

W. A. Setchell, Professor of Botany, is a member of the subcommittee on Botanical Investigations of the Pacific Coast Research Conference. W. L. Jepson, Associate Professor of Dendrology, is a member of the State Council of Defense.

DEPARTMENT OF CIVIL ENGINEERING

Beginning with the academic year 1918–19, the Civil Engineering College will administer a four years' curriculum in Military Engineering leading to the degree of Bachelor of Science in Civil Engineering. This course of study is designed to prepare students for admission to the Corps of Engineers, United States Army, by competitive examination under the rules of the War Department.

C. G. Hyde, Professor of Sanitary Engineering, was a member of the Engineering Commission (G. A. Elliott, Chairman, Professor C. D. Marx of Stanford University, the third member) appointed by Colonel I. W. Luttle in charge of Cantonment Division, to design sanitary works for Camp Fremont, Menlo Park, California. Professor Hyde is now a Captain in the Sanitary Corps.

A. C. Alvarez, Assistant Professor of Civil Engineering, is assistant to the Manager of the University Military Bureau.

A. J. Eddy, Assistant Professor of Civil Engineering, is Captain in the Coast Artillery, stationed at the San Francisco Presidio.

C. T. Wiskocil, Assistant Professor of Civil Engineering, under the direction of Charles Derleth, Jr., Professor of Civil Engineering and Dean of the College of Civil Engineering, and assisted by J. R. Shields, Engineer in Testing Laboratory, conducted 250 individual tests on airplane materials during the year in the presence of government inspectors. Professor Wiskocil left for Washington May 15, to assist in the study of concrete ship construction. He was employed throughout the summer by the United States Emergency Fleet Corporation, Concrete Ship Construction Department.

E. D. Hayward, Instructor in Civil Engineering, is Second Lieutenant in the Sanitary Corps, stationed at Camp Fremont.

Principally under Valdemar Arntzen, Expert Mechanic in Civil Engineering Laboratory, the Civil Engineering Department during 1917–18, coöperating with the Department of Astronomy, assisted in designing and perfecting range finders for Captain Dinsmore Alter, C. A. R. C., formerly an instructor in the Department of Astronomy. From January to April, 1918, Mr. Arntzen and his assistants constructed numerous pieces of apparatus for Captain Stratton, formerly Professor of Psychology, and now in the United States Signal Corps. This equipment, to be used in the Aviation Schools at San Diego and at Kelly Field, Texas, consists of a set of three tambours, one pneumograph tube, one hand steadiness apparatus, one tilting chair and one reaction time apparatus. The equipment was made in coöperation with the Department of Psychology.

DEPARTMENT OF CHEMISTRY

Upon the outbreak of the war the Department of Chemistry held a meeting at which the instructors and students, both graduate and undergraduate, signed a pledge to work on any problem that might be assigned to them. Forty men were thus enrolled to devote their time to research and other work necessary to the prosecution of the war. The character of the tasks was varied: some were submitted by the National Council of Defense, some came from the state, some from chemical manufacturers in California, and some were suggested by members of the staff as timely or of value to California, either by virtue of its natural resources or its needs. A number of the men of the department have devoted a large part of their time to this work, some of them giving twelve to sixteen hours a day. A large measure of success has been attained in many cases.

While the problems submitted by the National Council of Defense must for the present be kept secret, not all of the investigations are of a secret nature. For example, the investigation of potash has been a subject of importance. As a fertilizer, potash is indispensable. While California soils may not as yet be in great need of this chemical, large quantities are used in the East. Prior to April, 1917, nearly half a million tons were imported. Only a small amount was made in this country. At present 200,000 tons are produced in the United States, with California in the front of the industry.

Long before the war there was a small production of potash made from seaweed. At first the drift seaweed was collected from the beaches, dried and burned, and the ash containing a small per cent of potash was sold as a fertilizer. Later this industry developed on a greatly increased scale, and at this writing many corporations maintain large factories. It was soon found, however, that the drift seaweed would not suffice for the greater demands, and com-

plicated and ingeniously contrived machines were used to harvest the seaweed from the kelp beds in the ocean. Elaborate and extensive plants were erected to work up this seaweed into various products, for the industry had expanded beyond the making of potash. Bromine, iodine, various organic bodies, such as acetone, butyric and propionic acids, were all made in large quantities from the seaweed; much of this work was done by graduates of the Chemical Department, in and outside the laboratories of the University of California.

Other sources of potash are the saline lakes and deposits in the southeastern part of the state, mainly in San Bernardino and Inyo counties. Considerable capital has been invested in some of these enterprises and the production of potash from these sources has reached large proportions. Just as in the case of seaweed, other products in addition to potash are obtained from these lakes and deposits, among them being salt, carbonate of sodium, sulphate of sodium, chloride and sulphate of magnesium, borax and boracic acid, and other bodies. In these instances, also, the laboratory of the Department of Chemistry has been of real service.

The ocean offers the same type of problems as do the saline lakes. Potash is a constituent of the ocean water as are nearly all other known salts. One of the questions taken up recently in the laboratory of the department was the separation of potash salts from ocean water. For several months this work has engaged the attention of a number of instructors and students who have studied the matter in both a theoretical and practical way. The largest source of potash, of course, is the ocean, but the difficulties of separating the other constituents of sea water offer many a baffling problem to the chemists of America.

In some cases nature has solved the difficulties, and it is for this reason that hitherto the Germans have had a monopoly of the potash industry. Ages ago a part of the ocean was confined near Stassfurt, and processes of frac-

tional crystallization went on, separating the salts formerly in solution into solid beds of relatively pure materials. Attempts have been made to reproduce these conditions by varying the rate and character of evaporation of sea water to obtain the various salts, potash, magnesium, etc., in a similar condition of purity. Some practical results have been obtained and considerable quantities of potash and magnesium are being manufactured by some of the salt companies on San Francisco Bay.

A number of years ago, one of the former students of the Department of Chemistry, then instructor, devised a process for dissipating fogs and mists by means of a high tension electric discharge. This process, first used for cleaning the air of acid particles that were a nuisance and money loss in various acid factories and metallurgical works, then extended to purifying air of dust and other small particles, has become one of the most important industrial processes, and is used all over the world. It was installed by another of the graduates of the University of California at a cement factory at Riverside to eliminate the dust. When examined the dust was found to contain potash; a method was developed to collect it, and now it is used all over the United States for this purpose. Already it has changed the character of some of the cement mills—potash is now the main source of profit, and the cement merely a by-product.

Other sources of potash are rocks, minerals, and ashes of plants. From the last named source small amounts of potash are obtained by a simple proces sof lixiviation.

Another set of problems studied in the department's laboratory pertains to the production of cyanides. While cyanides of potassium and sodium are used to a considerable extent in California as insecticides and in the metallurgical industries, none has been made in the state. New methods of production promise to be of great value in converting certain raw materials into cyanide. Closely related to this aspect of the war work of the Chemistry Department

is the question of producing cyanimide, a derivative of cyanogen and ammonia, a chemical made in enormous quantities in Europe for use as a fertilizer. Some of the earliest work on this material was done in the department's laboratory, where the conditions necessary for its preparation were ascertained.

Other electrochemical products of importance studied in the departments are caustic soda, chlorine and various chlorine derivatives, steel, various ferroalloys, such as ferrochrome, ferromanganese, ferrosilicon, magnesium, copper, and zinc. Graduates of the University have been connected with the development of each of these industries.

Under the stimulus of the war, the manufacture of another class of chemicals, all of considerable technical importance, has been begun in this state by the department's graduates. This class includes organic preparations, such as anilin colors, benzoic acid, metol, saccharin, and phthalic anhydrids. Previously most of them were imported from Europe; now many of them are made in our own state.

Two of the University's graduates have devised methods for the synthetic preparation of important organic compounds. One has succeeded in making glycerine from sugar; another in preparing tartaric acid from starch. Both of these bodies are relatively expensive substances. Glycerine has heretofore been prepared from fats; tartaric acid, from grapes. The synthetic methods produce them from relatively cheap materials, viz., starch and sugar. Inasmuch as sugar can be made from starch, the importance of these processes is self-evident.

California petroleum offers another fruitful field for chemical investigations. The use of this material for the manufacture of gasoline, kerosene, lubricating oil, and asphaltum is familiar to every one, but the employment of petroleum as a source of raw material for the manufacture of chemical products is not so apparent. Without writing in detail it may be pertinent to mention toluol, the starting

point of trinitrotoluol, one of the most important explosive materials in the present war. Other problems that have been worked on in connection with petroleum are methods for increasing the amount and quality of the gasoline and kerosene fractions and for improving the character of the lubricants. All are of great importance in the present crisis.

The disposal of wood waste affords another field for research. In California most of the wood waste is burned in order to get rid of it, although in a few cases potash is obtained from the ashes. At various times wood distillation plants have been erected, usually on a small scale. Attempts have been made to convert this material into alcohol and other products. The character of the products varies greatly with the variety of wood employed. One of California's graduates has shown that the stumps of the redwood yield relatively large amounts of phenol, or carbolic acid, of an unusual degree of purity. It is from this substance that many of the high explosives are made; lyddite, melinite, cerasite, shimosite are all derivatives of phenol.

Many experiments have been made in the laboratory of the department on the numerous trees and shrubs indigenous to California, and new chemical products of the most varied nature have been extracted. Oils, waxes, tanning materials, substitutes for rubber, alkaloids and other drugs, coloring matters that can be used for dyes, and numerous other materials have been separated and their properties studied.

The manufacture of essential oils from native and cultivated plants offers a large field for research. Various investigations in this area have been carried out in the laboratory of the department and some industries of this nature have been established under the direction of University of California graduates.

The above résumé indicates briefly the character of the problems that the Department of Chemistry has been endeavoring to solve. In addition, it has attempted to

compile a list of the chemical industries of the state with a view to obtaining data for assisting the technical men in their problems. An extensive correspondence is conducted. Advice is given to inquiring visitors who ask for information or assistance. Some of these questions entail considerable research, but it is always the endeavor of the department to be of assistance to the citizens of the state and to help them in every way possible.

The difficulties of the work have been increased by the inability to obtain necessary apparatus and supplies. Many of these materials were made in Germany, and it is only recently that the American manufacturers have been able to supply the demand. Added to this was the greatly increased cost of supplies that were obtainable. The California State Council of Defense came generously to the aid of the department. Without their assistance it probably would have been impossible to carry out the programme. Another handicap lay in the fact that a large proportion of the staff had left for the national service, greatly increasing the burden of those who remained. But each man has done his duty, has speeded up as much as possible, has worked longer hours, has done his work in the face of great difficulties, and has not become discouraged or apathetic.

From an original number of forty-five, the Department of Chemistry has contributed more than a score of members of its staff of instruction to the military and other branches of the government during the war emergency. Their names will be found listed in another portion of the War Record.

Gilbert N. Lewis, Professor of Physical Chemistry and Dean of the College of Chemistry, has been commissioned Major in the Gas Service of the United States Army, in France.

Edmond O'Neill, Professor of Inorganic Chemistry, Director of the Chemical Laboratory, and Acting Dean of the College of Chemistry, is Director of the Naval Con-

sultation Board of California, and is also engaged in chemical investigations for the State Council of Defense.

W. C. Bray, Associate Professor of Chemistry, is a member of the subcommittee on Inorganic Chemistry of the National Research Council.

J. H. Hildebrand, Associate Professor of Chemistry, is Captain in the Ordnance Department.

Merle Randall, Assistant Professor of Chemistry, is a member of the subcommittee on Inorganic Chemistry of the National Research Council.

G. E. Gibson, Instructor in Chemistry, is engaged in chemical research for the National and State Councils of Defense.

W. L. Argo, Instructor in Chemistry, is with the Bureau of Mines.

G. E. K. Branch, Instructor in Chemistry, is with the 50th Gordon Highlanders, Canadian Army.

R. F. Newton, Assistant in Chemistry, is with the Field Artillery.

T. P. Stewart, Instructor in Chemistry, is First Lieutenant, Chemical Service Department.

DEPARTMENT OF ECONOMICS

In October, 1917, the Department of Economics first gave tangible evidence of its ability to aid the government in war work. At that time the Labor Adjustment Board, investigating the strike then paralyzing shipbuilding, invited C. C. Plehn, Professor of Finance on the Flood Foundation, H. R. Hatfield, Professor of Accounting on the Flood Foundation, Jessica B. Peixotto, Professor of Social Economics, and F. R. Macaulay, Instructor in Economics, to its conference, with the result that Mr. Macauley presented an index to the board showing the increase of the cost of living in this district. I. B. Cross, Associate Professor of Economics on the Flood Foundation, later conducted for the Board a detailed inquiry on the cost of living between October 1, 1917, and March 1, 1918. In this work he was assisted by Felix Fluegel, and G. F. Mitch, both Assistants in Economics.

In February, 1918, Professor Hatfield, aided by Professor Cross, Mr. Macaulay, E. A. Kincaid, Instructor in Economics, and Mr. Fluegel, prepared a report for the United States Shipping Board on the labor conditions, possible output, etc., of the California shipbuilding plants. The Shipping Board characterized the work as "an invaluable service to the Government in carrying out its shipbuilding programme." Since that time Professor Cross has been in constant touch with the largest shipbuilding plants and some of the unions in connection with the shipbuilding problems.

At the suggestion of the Ordnance Department in Washington, the Department of Economics has conducted four ordnance training schools, the purpose being to give preliminary training to men who are expected ultimately to reach the grades of non-commissioned, and in some cases, of commissioned officers in the Ordnance Service. The course of study at Berkeley covered the principles of storeskeeping, calculating methods of accounting, military organ-

ization, military correspondence, military law and military courtesy. One hour a day was devoted to drill. The time allotted for the course was six weeks. Those in charge were Professor Hatfield, Stuart Daggett, Professor of Railway Economics on the Flood Foundation, Mr. Macaulay, C. C. Staehling, Instructor in Accounting, and Dr. H. B. Drury.

Professors Hatfield and Daggett are members of the Subcommittee on Economics of the State Council of Defense. This committee has published a report on "The Relation of State Banks to the Federal Reserve System," dealing with the necessity of concentrating credit facilities during the war. Professor Daggett also spent several months in preparing a report to the State Council of Defense on "The Iron and Steel Industry about San Francisco Bay with Special Reference to the Available Supply of Raw Material."

Professor Plehn has been a member of the Second and Third Liberty Loan committees of Berkeley and the University of California. He was a delegate to the Joint Conference of the Western Economic Society and the City Club of Chicago, held in Chicago, June, 1917, to discuss the "Financial Mobilization for War." He was also a delegate from California by appointment of the Governor of California to the Congress of States to discuss the "Coördination of Federal and State Taxation," held in Atlanta, Georgia, October, 1917, and called with the official sanction of President Wilson. He prepared a paper on "War Finance" read before the Commonwealth Club of San Francisco and published in the Transactions of that body; and also a pamphlet on "War Finance in Great Britain, France, Germany and the United States," written at the request of the San Francisco Patriotic Liberty Loan Committee of 1000 and used as part of its propaganda for the Third Liberty Loan.

Professor Daggett and Mr. Macaulay have served as assistants to the Berkeley Exemption Board, No. 1, while Professor Cross is one of Berkeley's Four Minute Men.

C. E. Brooks, Assistant Professor of Insurance, has served as Actuary and Advisor to the United States Bureau of War Risk Insurance, preparing various bulletins, determining questions of policy and interpreting the Soldiers' Insurance law.

Professor Peixotto is a member of the Subcommittee on Women in Industry of the National Council of Defense and also a member of the same committee of the State Council of Defense. During the first half-year of 1918 she was on leave of absence from the University as Executive Chairman of the Child Warfare Department of the Women's Committee of the National Council of Defense. During the first semester Professor Peixotto and Miss Lucy W. Stebbins, Associate Professor of Social Economy, conducted a Red Cross Training School for Home Service at the University, in which work they were assisted by Professor Cross and Mr. Macaulay. During the second semester a similar school was conducted in San Francisco under the direction of Solomon Blum, Associate Professor of Economics, and Dr. Louise Morrow, Assistant in Social Economics. Professor Stebbins is a member of the Home Service Committee of the Berkeley Branch of the Red Cross, of the University Auxiliary of the Red Cross, of the Advisory Board of the Women's Land Army and of the Executive Committee of the Berkeley Chapter of the Red Cross. She is also one of the traveling lecturers on Home Service authorized by the National Red Cross Committee.

Lincoln Hutchinson, Professor of Commerce on the Flood Foundation, is in Washington acting as Head of the Export Division of the War Trade Board. H. S. Shuey, Lecturer in Economics, has been a member of the San Francisco Third Liberty Loan Committee and of various Red Cross committees. Professors Hatfield and Daggett are spending the summer in Washington, engaged in work of the highest importance for the War Industries Board.

UNIVERSITY EXTENSION DIVISION

The Bureau of Correspondence Instruction of the Extension Division has given enlisted men a special reduction of 40 per cent on all fees in the various courses and has provided special classes to meet the needs of men in service. The Extension Division has also coöperated with all official bodies in "drives" about the bay counties and in Los Angeles, and has been of genuine assistance in providing junior officers for the naval forces of the country through its courses in Navigation and Nautical Astronomy.[21]

The Bureau of Lectures gave twelve lectures in Los Angeles on "Problems Arising Out of the War." Similar lectures have been given elsewhere.

The Bureau of Public Discussion has been instrumental in directing the debating activities of the high schools of the state upon war subjects, not only giving the debaters special knowledge on international topics, but being of great educational value to the thousands of persons who have heard these debates.

The Bureau of Visual Instruction has circulated stereopticon slides and moving picture films designed to inform the public concerning war service in the form of liberty loans, etc. It has prepared and circulated throughout the state a monthly lecture on current events dealing principally with war conditions.

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[21] See report on Training for U. S. Navy and Merchant Marine, p. 23.

DEPARTMENT OF GEOLOGY AND MINERALOGY

Shortly after the entrance of the United States into the war the problem of the supply of certain minerals essential to war industries became very important. The situation was particularly serious because previously we had depended to a large extent on importation from distant lands. The war produced a scarcity of merchant ships, and the demand for all obtainable ship tonnage for the transportation of men, munitions, food and other war necessaries to Europe became most urgent.

It was known that California contained some of these important mineral substances, though before the war little had been done to secure them because they could not be laid down with profit in the industrial centers in competition with the imported material. The extent of our resources was not even roughly known, nor was it estimated what yearly contribution California could make to the necessary industrial supply. Prospectors and miners in general were not familiar with the desired minerals, their appearance, mode of occurrence, characteristics, or the promising localities for their discovery.

Following the appointment of G. D. Louderback, Professor of Geology, as Chairman of the Committee on Geology and Mineral Resources of the State Council of Defense, all of his time not demanded by necessary University duties was given to organized systematic investigation of certain California war mineral problems both in the field and in the laboratory. In this work he was aided by E. F. Davis, Instructor in Mineralogy and Geology, F. S. Hudson, Teaching Fellow in Geology and Mineralogy, and N. L. Taliaferro, graduate student.

The chief object of investigation this year was manganese. Over one hundred mines and prospects, lying in eighteen counties, have been examined and their nature, probable extent, origin, and availability investigated. The field and laboratory work on this subject led to definite

recommendations to the government boards, based on possibilities of production. A brief paper, presenting some of these conclusions, was published by the *Mining and Scientific Press* on March 30. There was also prepared a tabular report by countries, arranged for quick reference to the various properties examined and their most important characteristics, and a more extensive report on the geology and prospective value of these properties. The latter reports, carrying considerable confidential information for the use of the government, have not been published, but copies have been placed in the hands of the appropriate government bureaus and boards, and of the National Research Council. The department was assured by them that the results and the mode of presentation were very satisfactory and of special value at the present time.

A great deal of energy has been expended on work that does not lead to definite reports, but which is believed to be of public value in assisting the development of war minerals. Some of the activities may be outlined as follows.

1. Advising prospectors as to the nature and value of the mineral substances they have found. Hundreds of samples have been examined, both in the field and in the laboratory. In addition, the prospector is advised which minerals are worth following up, how best to do it, etc.

2. Calling the attention of prospectors and others, by letter and personal conference, to materials of special value in the war industries that are likely to occur in the regions in which they are working.

3. A case of California war minerals has been set up in the Geological Museum, especially to illustrate to the prospectors, most of whom are not familiar with the war minerals, the appearance of the different mineral types and different grades of ore, and of the commonly associated rocks. Descriptive labels accompany the specimens, and personal explanation and advice are often given the visitors.

4. We have sought to learn of conditions in any part of the state that interfere with or prevent the operation of properties, or the marketing of products, with the idea of taking such steps as seem feasible to overcome or obviate such conditions. A number of these cases have been placed in our hands, and several have been successfully remedied.

5. We have sought to engage the coöperation of other agencies in the study of special questions related to war minerals, supplying data and samples to assist such studies.

6. We supply, in so far as we are able, information that may be needed by committees, government departments, or other agencies that are seeking to solve scientific, commercial, or administrative problems affecting or affected by the mineral industry. Requests for such information are continually coming from manq quarters.

Recently, plans have been maturing for a more definite basis of coöperation with the United States Bureau of Mines, the United States Geological Survey, and the Mining Department of the University, with all of which we have coöperated in an informal way during the last year.

Letters of approval of the work of the department have been received from Mr. S. Paige, Acting Chief Geologist, and Mr. G. O. Smith, Director of Survey, of the United States Geological Survey, from Mr. Edmund Newton, in charge of manganese investigations of the United States Bureau of Mines, and L. H. Duschak, Superintendent of the Berkeley Branch Station, and from Mr. Whitman Cross, Vice-Chairman of Division of Geology and Geography, and J. C. Merriam, Chairman of Division of Geology and Geography of the National Research Council.

A. C. Lawson, Professor of Mineralogy and Geology, and Dean of the College of Mining, is a member of the Subcommittee on Geology of the Pacific Coast Research Conference.

DEPARTMENT OF HOME ECONOMICS

Household Science

Food Administration Work

During the special term of five weeks, May 21 to June 23, 1917, two courses were offered in the Household Science Division of the Home Economics Department: the Red Cross course in Home Dietetics, by Josephine E. Davis, Assistant Professor of Household Science, and Miss Doris Daniels; and an Emergency Normal Course intended to give volunteer leaders of clubs and communities information and training in methods of presentation of the message of food conservation. Agnes F. Morgan, Assistant Professor of Household Science, was in charge.

There were registered in the Red Cross course one hundred and fifty women, of whom one hundred and twenty finished the work and received the Red Cross Certificate. Several of these young women have since entered the service as Nurses' Aids.

In the Emergency Normal Course there were registered twenty-one well qualified women, of whom seventeen finished the work. Most of these women are now active directors of food conservation work in their own communities.

During the Summer Session of 1917, a popular dietetics course largely devoted to problems of food conservation was attended by fifty nurses and forty-seven housewives.

On Sunday, July 1, 1917, a Half-Hour Programme on Food Saving was held in the Greek Theatre, under the auspices of this division. Mrs. R. O. Moody, Mr. A. H. Naftzfier and Professor Morgan spoke to a large audience on various phases of the subject

Food Experiments and Analyses

During the fall term of 1917, Professor Morgan and Edith L. Brown, Laboratory Assistant in Household Science, made a large number of analyses and digestibility experiments on whale meat in the hope of establishing the usefulness as human food of this hitherto wasted material. The senior dietetics class coöperated in this endeavor, as well as in a similar set of experiments upon ostrich meat, samples of which were sent to the department by the British and American Mercantile Company of El Centro. A bulletin on the results of these experiments is contemplated.

Public Speaking

In October, Professor Morgan met classes of women in Berkeley and Oakland for the purpose of aiding them in public speaking preparatory to the Food Pledge Drive of the last week of October. At Dean Stebbins' request, the housekeepers for the girls' clubs and boarding houses met during November with Professor Morgan to discuss ways and means of obeying the behests of the Food Administration.

Since April, 1917, all members of the staff, as well as several of the students, have given frequent talks and demonstrations before women's clubs, schools, churches, and other organizations in the interests of food conservation.

War Emergency Bulletins

The series of *War Emergency Bulletins* was begun in November, 1917. The five following have been issued in mimeographed form, and about 800 copies of each distributed:

No. 1. Practical Hints on Food Conservation. 5 pages.
No. 2. Milk, a Cheap Food at any Price. 4 pages.
No. 3. The Honor Ration. 3 pages.
No. 4. Suggestions for Instruction in Food Values through Window Exhibits. 11 pages.
No. 5. The Fuel Value of Food in Every Day Terms. 7 pages.

Dietary Survey

The Home Economies Department has coöperated fully with the National Dietary Survey now being carried out by Dr. C. F. Langworthy of the United States Department of Agriculture, four family studies, and two group studies having been finished and sent in since November, 1917. Besides these a careful record of consumption of food at the Associated Women Students' Counter for three weeks was kept by Miss Beatrice Marks, and will be shortly forwarded to Washington. This record shows an interesting reaction by the women students following the beginning of the Food Administration courses in February, 1918.

Food Conservation Courses

In February, 1918, the following courses as requested and outlined by the Food Administration, were given. A series of lectures on Food and the War, given by Professor Morgan, covered a period of twelve weeks. The total enrollment was six hundred and thirty-seven, of whom four hundred and ninety-two finished the course with credit. In the course on Fundamentals of Food and Nutrition in Relation to the War, two lectures by Professor Morgan were given each week for twelve weeks. The enrollment was sixty. The twelve weeks' course on the Use and Conservation of Food combined lectures with laboratory practice. This was supervised by Miss Davis assisted by Miss Alice B. McLear. Sixty-three were enrolled.

At the end of the term, students registered in all the courses were asked to hand in their names, home addresses, summer plans and to indicate their willingness to assist in Food Administration work. Over four hundred students responded, and the data secured was sent to the office of Ralph P. Merritt, Federal Food Administrator of California.

Final Rally

In the last week of the term, May 6 to May 10, a series of five lectures, summarizing as far as possible the material presented in the lectures on Food and the War was given. From thirty to fifty persons were present at each of these lectures.

Besides the distribution of the pamphlets sent us by the United States Food Administration, copies of the *War Emergency Bulletins* above mentioned were distributed to each of the students registered in the Food Administration courses.

Speakers' Seminar

At the request of several of the students in these courses an evening seminar in public speaking was held weekly during the term. Practice in short talks on food conservation at these meetings gave many students confidence to address outside clubs and schools.

An exhibit under glass, changing each week, and illustrating the material covered by the lectures in Food and the War, has been maintained in the lower corridor of the Library Building. Miss Alice H. Metcalf has been in charge.

Volunteer Student Service

Through the recommendation of Mr. Merritt, the United States Food Administration has asked Professor Morgan to act as state secretary for California in directing the activities of the students in food conservation courses in the various colleges and state normal schools. Professor Morgan was asked to provide plans and an organization for the coherent effectiveness of this potential force. She expects to coöperate with the already developed county organization worked out by Mr. Merritt and Miss Ebbets. Besides the University of California there are seventeen other institutions in the state which have been giving courses on the food problem. Miss Elizabeth Bridge has been asked to act as assistant in this undertaking.

Conference with Dean Arnold

On April 15, in the Home Economics Building on the Campus, a conference of representatives of all the universities, colleges and normal schools of California was called by the department at the request of the United States Food Administration. Dean Sarah Louise Arnold of Simmons College, a representative of the Collegiate Section of the United States Food Administration, spoke on the further use of women trained under the plan of Food Conservation courses. The meeting was attended by delegates from Stanford University, the University of Southern California, Mills College, Los Angeles Normal School, San José State Normal School, and also from the normal schools at Fresno, Chico, and San Francisco. A valuable spirit of coöperation among the workers present was established at this conference.

Dean Arnold addressed a large meeting of students in Wheeler Auditorium the same day upon the spirit of *noblesse oblige* as applied to service for the state in matters of conservation by university trained women.

Division of Household Art

In the summer of 1917, during the special term of five weeks from May 21 to June 23, four courses under direction of Mary F. Patterson, Assistant Professor of Household Art, were given by the instructors in Household Art, assisted by senior and graduate students of this division and five Red Cross volunteer instructors.

Two of these were clothing courses, one of which comprised the making of hospital garments and comfort bags in accordance with Red Cross specifications for civilian relief work. In these courses mature women intending to offer volunteer work were enrolled. The third was a Red Cross course in the Preparation of Surgical Dressings in which eighty-four students enrolled. Twenty-five of this number came from rural districts and small towns, seven

of these representing Indiana, Kansas, Nevada, Washington, Arizona, Utah, and British Columbia. Twenty-three students were recommended to the Women's Bureau of the American Red Cross as instructors in the Preparation of Surgical Dressings, receiving their certificates from Washington. Six of these became instructors for the courses in Surgical Dressings undertaken by the women students of the University Red Cross at Hearst Hall during the second semester of 1917–18. Twenty-four others were recommended to organize circles in Red Cross work in their home districts in California.

The fourth course offered suggestions for organization and administration of women's war work, housekeepers' institutes and the establishment of home industries in rural communities. Fifty women representing rural communities in several other states were enrolled.

During the fall term, August to December, 1917, members of the Textile class tested samples of wool submitted by the manufacturers to the Women's Bureau of the American Red Cross in San Francisco. Reports were sent to the chairman of the Women's Bureau as to the percentage of poor wool, and wool substitutes used, as well as to the spinning quality of the yarn.

In the spring term, January to May, 1918, a study of costs of raw materials was carried on by thirty-five students enrolled in House Management, each member of the class making a careful survey of the daily cost of food per person in homes or sorority houses, schools, state or county institutions throughout the bay district.

Ten seniors and graduate students in Household Art offered their practice teaching in Berkeley and Oakland schools, where the work consisted of making garments for civilian relief according to Red Cross specifications.

DEPARTMENT OF HYGIENE

The University of California Infirmary has shared its clinic and hospital facilities with the School of Military Aeronautics, offering every available assistance not only with its equipment but with its medical staff and nurses.

In the early part of the war, Dr. R. T. Legge, Professor of Hygiene and University Physician, with the assistance of Dr. A. M. Meads, Associate University Physician and Lecturer in Hygiene, and now Captain in the Medical Reserve Corps, conducted the physical examinations of some three hundred men for the First Officers' Reserve Training Camp at the Presidio.

Through this department, Ambulance Company, No. 2, U. S. A., now at Allentown, Pennsylvania, was organized from the student body of the University. This company later became a battalion by the addition of two other companies from eastern universities, but the official title of No. 2, known as the University of California Battalion, still remained. The officers, Major Alvin Powell and Captain A. M. Meads, are members of the Infirmary staff. Two other members of the staff have also joined the colors; Lieutenant (Junior Grade) Milton Schutz, Ophthalmologist in the Infirmary, is now in the United States Navy, and Lieutenant G. F. Stoodley, Dental Surgeon, is assigned to the School of Military Aeronautics.[22]

Three of the staff nurses, Miss Sarah W. Cheek, Miss Theresa Casenave, and Miss Thea Hauge, are Red Cross nurses in active service—one in France, the others in base hospitals in the United States.

The Department of Hygiene has provided instructors in the Red Cross courses and has trained several hundred men and women in First Aid and Home Care of the Sick. These

[22] Since this report was written, Dr. Legge has been commissioned Captain in the Medical Reserve Corps and has been detailed for service at the School of Military Aeronautics located at the University. He is continuing to serve the University, however, as Professor of Hygiene and University Physician.

courses were conducted in the Summer School, the intersession, and during the academic year. Members of the staff have also conducted several courses in First Aid and Home Care of the Sick under the auspices of the Berkeley Chapter of the American Red Cross. These activities were carried on in a creditable manner by the following: Drs. Paroni-Meads, Assistant Professor of Hygiene and Physician for Women; C. L. McVey, Physician for Men; Kate Gompertz, Physician for Women and Assistant in Orthopedic Surgery; Ruby S. Cunningham, Instructor in Hygiene and Associate Physician for Women; Mrs. R. R. Storer, Assistant Physician for Women, and the Misses Ethel Sherman, Superintendent of Infirmary; B. R. Steeves, Assistant in Hygiene, and Laura Carins, Assistant in Hygiene. Miss Sherman is also member of the State Committee for the American Red Cross Nursing Service.

The Infirmary staff made all the physical examinations for men entering the 1917 Summer School Military Camp, conducted by Major, now Lieutenant-Colonel Nanee; also for men entering two naval courses, given under the auspices of the University, besides examining recruits for various training camps, ordnance courses and a women's land company.

The Infirmary staff has rendered valuable services in immunizing men and women who have entered the Y. M. C. A., Red Cross, and other agencies, against smallpox and typhoid.

Four members of the department are members of the executive committee of the local chapter of the American Red Cross and have materially aided in the work of the Berkeley chapter.

Dr. Legge is Director of First Aid under the Bureau of Military Relief of the Pacific Division of the American Red Cross and has organized and promoted instruction in First Aid and Safety in Industry. The object of this work is to change the attitude of the public towards accidents,

and to prevent unnecessary suffering and its economic losses.

Another activity interesting the Department of Hygiene, and to which the administrative head has given considerable attention, is the development of a course of Occupational and Vocational Training for the Rehabilitation of Crippled Soldiers and Sailors. It is expected that the authorities at Washington will recognize not only the central location of the University of California, but its available resources to carry on successfully this important work.

DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING

The shops of the Department of Mechanical and Electrical Engineering have become veritable war laboratories. The installation of a new steam turbine and a steam boiler of small capacity, the addition of three steam engines of representative type, as well as internal combustion engines of the marine, stationary and automobile types for experimental work in the Steam and Power Laboratory have served effectively to meet the demands of the hour. Plans for the coming year include the addition of a chair in Marine Engineering and Naval Architecture, also new courses in Automobile Engineering and Aeronautics, both closely allied to the present need for training in military engineering.

C. L. Cory, John W. Mackay, Jr. Professor of Electrical Engineering, Consulting Electric Light and Heating Engineer, and Dean of the College of Mechanics, is Assistant Director of the Division of Electrical Power Supply at the United States Government Explosive Plants. At present he is stationed at Charleston and Nitro, West Virginia, where the Nitro Smokeless Powder Plant is being constructed. Professor Cory is also a member of the Committee of Engineering and Inventions of the State Council of Defense.

B. F. Raber, Associate Professor of Mechanical Engineering, has been prominent in work connected with the School of Military Aeronautics.

R. S. Tour, Assistant Professor of Gas Engineering, is First Lieutenant in the Ordnance Reserve Corps, at present assigned to duty in the vicinity of New York City.

H. B. Langille, Assistant Professor of Machine Design and Mechanical Drawing, is a Lieutenant in the Navy, stationed at the United States Naval Training School, San Pedro.

F. B. Pernot, Assistant Professor of Electrical Engineering, is Captain in the Signal Reserve Corps, assigned to duty at the Bureau of Standards, Washington.

B. M. Woods, Assistant Professor of Theoretical Mechanics, is President of the Academic Board of the School of Military Aeronautics.

B. R. Van Leer, Instructor in Mechanical Engineering, is First Lieutenant, Engineer Reserve Corps, Camp Lewis, Washington.

G. L. Greves, Instructor in Electrical Engineering, has given instruction in Military Transmission of Intelligence to University and other students. During the 1918 Summer Session he gave a six weeks' elementary course in radio communication. It is planned to continue this work in the fall semester, with instruction in radio transmission, including commercial and military equipment, elementary telegraphy, telephony and circuit work. Code practice will be included.

D. W. Dickie, Lecturer of Marine Engineering and Naval Architecture, has been practically in charge of the instruction in Marine Engineering and Naval Architecture in the course of naval preparation since January 5, 1918, and, since May 20, of the engineering course of the United States Shipping Board School at the University.

A. B. Domonoske, Instructor in Mechanical Engineering, has given instruction in the engineering course of the United States Shipping Board School at the University.

L. B. Clark, Mechanic in Electrical Laboratory, has been a member of the technical staff of the School of Military Aeronautics since July 15, 1917.

E. J. McDonald, Mechanic in Steam and Gas Laboratory, has been an assistant in the laboratories in the engineering course of the United States Shipping Board School since May 20.

MEDICAL SCHOOL

The University of California Medical School has somewhat modified its curriculum in order to better prepare students for their work in the Army and Navy. It has also contributed many of its staff for active government service, chief among whom may be mentioned:

Dr. H. C. Moffit, Professor of Medicine and Dean of the Medical School, Major and Chief of Medical Service at Camp Travis, Texas (until February, 1918); Dr. E. S. Kilgore, Assistant Clinical Professor of Medicine, Major; Dr. J. L. Whitney, Assistant Clinical Professor of Medicine, Captain in the Air Service; Dr. J. B. Frankenheimer, Instructor in Medicine, Major; Dr. E. J. Best, Instructor in Medicine, Captain; Dr. E. H. Falconer, Instructor in Medicine, Captain; Dr. J. M. Rehfish, Assistant in Medicine, Lieutenant; Dr. W. W. Behlow, Assistant in Medicine, Lieutenant, U. S. N.; Dr. Lovell Langstroth, Instructor in Medicine, on local exemption board; Dr. L. H. Briggs, Instructor in Medicine, on local exemption board; Dr. G. H. Evans, Assistant Clinical Professor of Medicine, Chief Medical Examiner on the State Advisory Board, No. 5; Dr. S. H. Hurwitz, Assistant Clinical Professor of Medicine, assisting Dr. Evans; Dr. G. E. Ebright, Assistant Clinical Professor of Medicine, President of the State Board of Health.

Department of Surgery

At the suggestion of the Surgeon-General of the Army, Dr. T. W. Huntington, Emeritus Professor of Clinical Surgery, made arrangements whereby selected groups of medical officers from the United States Army would be instructed for a period of one month in the surgical treatment of fractures, wounds and shock. On March 12, 1918, the first class of twelve Medical Reserve officers, followed by a second group on April 16, received instruction from

members of the University of California Medical School, aided by faculty members of the Stanford University School and by faculty members of the Stanford University of Medicine.

The Department of Surgery began the organization of Base Hospital Unit, No. 30, and gave intensive instruction to a considerable number of the enlisted personnel.

The following doctors have gone forth from the department for immediate government service:

Alanson Weeks, Instructor in Surgery; W. I. Baldwin, Instructor in Orthopedic Surgery; H. C. Naffziger, Instructor in Surgery; F. C. Lewitt, Instructor in Laryngology, Otology and Rhinology; H. S. Thomson, Instructor in Surgery; L. P. Howe, Instructor in Surgery; L. C. Abbott, in the Department of Surgery; Henry Horn, Assistant in Laryngology, Otology and Rhinology; W. A. Fisher, Assistant in Orthopedic Surgery; J. Visalli, Assistant in Surgery; J. H. Woolsey, Assistant in Surgery; F. H. Shook, Voluntary Assistant in Laryngology, Otology and Rhinology; A. G. Gibson, Voluntary Assistant in Surgery; Hudson Smythe, Assistant in Urology; C. A. Wills, Voluntary Assistant in Surgery.

Department of Pathology

The Department of Pathology is taking an active part in the instruction of Medical Reserve Corps officers, largely under the direction of Dr. G. Y. Rusk, Associate Professor of Pathology. These officers receive demonstrations in gross pathological anatomy, special emphasis being laid on the clinical-pathological correlation in autopsy technic, when opportunity offers, and in surgical pathology. It is also planning a series of investigations in the pathology of anaërobic infections, a better knowledge of which is now necessary for field surgery.

Department of Orthopedic Surgery

The Department of Orthopedic Surgery has given instruction in the handling of plaster, making of bandages, application of casts, etc. It has sent two doctors to the British War Hospital at Edinburgh, and has supplied its quota to Base Hospital Unit, No. 30. Dr. H. H. Markel, Assistant in Orthopedic Surgery, has examined several seamen from the Navy Yard.

Department of Pediatrics

The Department of Pediatrics has contributed the following men for the service: Dr. W. P. Lucas, Professor of Pediatrics, one of the organizers of the Medical and Social Service Work and Civilian Relief in France; Dr. H. K. Berkley, Assistant in Pediatrics, Army Medical Corps; Dr. Linton Gerdine, Assistant in Pediatrics, Navy; Dr. C. F. Gelston, Assistant in Pediatrics, aiding Dr. Lucas in France.

Department of Pathology and Bacteriology

The war work of the Department of Pathology and Bacteriology began, with the appointment of F. P. Gay, Professor of Pathology as a member of the Medical Section of the National Research Council and the California State Council of Defense, early in 1917. This was soon followed by an appointment as consulting expert under the American Red Cross for advice in medical problems arising in naval training stations. The first call in this line of duty came in June, 1917, from the Station on Yerba Buena Island, where a number of cases of cerebro-spinal meningitis had occurred among recruits. Professor Gay, being absent on vacation, delegated Ivan C. Hall, Assistant Professor of Bacteriology, to act in his stead. The latter cooperated with Surgeon P. S. Rossiter, U. S. N., Senior Medical Officer, and Assistant Surgeon A. J. Minaker in the establishment of a bacteriological laboratory and the

development of suitable methods for the detection of meningitis carriers. Upwards of 8000 recruits have been examined with the result that even with a greatly increased and congested population there have been far fewer cases of cerebro-spinal meningitis during the year than during the previous twelve months. As soon as Professor Gay returned, he undertook the investigation of a skin reaction produced by injection of an extract of meningococcus cultures, which it was hoped would simplify the technic of isolating carriers. An article entitled "The Occurrence of a Positive Intracutaneous Reaction in Meningococcus Carriers," was published in the *Journal of the American Medical Association*, January 26, 1918 (vol. 70, p. 215).

The preparation of the above mentioned extract led to an investigation by Miss Dolores E. Bradley, Assistant in Bacteriology, and Professor Hall of the question of suitable methods for the maintenance of meningococcus cultures, these organisms along with certain other highly parasitic bacteria having been found to require meticulous care in their repeated propagation under artificial conditions. Miss Bradley's work has resulted in a method of culture of meningococci which tremendously simplifies the problem of maintenance and transportation of these organisms for experimental and diagnostic purposes and in the manufacture of antimeningitis serum. Her article will appear over her name in the *Journal of the American Medical Association*, having been accepted under the title "Simple Methods for Prolonging the Viability of Meningococcus Cultures."

During the autumn of 1917 Professor Gay was appointed alternate director of the Metchnikoff, one of the four Pullman cars specially equipped by the American Red Cross for bacteriological laboratory purposes to be used in connection with outbreaks of infectious diseases in the national cantonments. A volunteer scientific staff was recruited, among whom were Professor Hall and Dr. C. L. A. Schmidt, Research Assistant in Pathology, in addition

to Professor Gay. The initial trip in this laboratory car was made to Kelley Field No. 1, San Antonio, Texas, Professor Gay in the meanwhile having been appointed Major in the United States Army Medical Corps. A further investigation of methods for the simplification of technic in isolation of meningococcus carriers was made.

Certain investigations being conducted within the department have a definite bearing on problems of war, e.g., the preparation of taurin, its fate on injection, and use in the therapy of tuberculosis; these are being made by Dr. Schmidt and Mr. Thomas Watson under grants from the State Council of Defense and the George Williams Hooper Foundation for Medical Research. Dr. Schmidt has also engaged in investigations of certain anesthetics. Miss Ruth Stone, Edith Claypole Research Assistant in Pathology, has continued a study of the typhoid carrier condition, has aided Dr. Schmidt in the study of tuberculosis, and has made some preliminary studies on the lytic action of certain bile salts on pneumococci. Professor Hall in collaboration with Mrs. L. J. Ellefson and other research students has continued and completed certain phases of study in connection with the group of anaërobic bacteria which are so prominent in the causation of gaseous gangrene, the most pressing bacteriological problem of the war. In the same group of organisms is found the most dangerous cause of food poisoning, *Bacillus botulinus;* several instances have been investigated during the past year. It happens also that similar organisms introduce a factor of considerable error in the sanitary examination of drinking water and milk; a method has been devised obviating approximately 90 per cent of the errors due to this cause, publication of which is promised in the July number of the *Journal of Bacteriology* under the title "The Elimination of Spurious Presumptive Tests for B. Coli in Water by the Use of Gentian Violet," and "A Brief Note on the Use of Gentian Violet in Presumptive Tests for B. Coli in Milk with Reference to Sporulating Anaërobes." There

was also published in *Science*, December 7, 1917 (vol. 46, p. 570), an article entitled "A Note on the Anaërobic Culture of Anaërobes at Higher Temperatures."

Department of Ophthalmology

The Department of Ophthalmology has examined the eyes of fifteen hundred applicants for the Aviation Corps, and has given considerable instruction to oculists who had entered the Red Cross units and branches of the Medical Reserve Corps.

Department of Neurology

The Department of Neurology has contributed 100 per cent of its staff to war work. Dr. R. L. Richards, Lecturer in Psychiatry, Dr. C. L. Tranter, Assistant in Neurology, and Dr. H. W. Wright, Assistant in Neurology, are all in service. Dr. Eva C. Reid, Assistant in Psychiatry, is abroad with the Women's Red Cross; Dr. V. H. Podstata, Lecturer in Psychiatry, has received a commission; and Dr. R. W. Harvey, Instructor in Neurology, and Dr. M. B. Lennon, Assistant Clinical Professor of Neurology, have served on advisory boards as medical examiners.

Department of Biochemistry and Pharmacology

The Department of Biochemistry and Pharmacology has been chiefly engaged in the study of the properties and actions of Tethelin, the growth-controlling substance from the anterior lobe of the pituitary body which has been shown to stimulate the healing of otherwise slowly healing wounds. This substance was the important discovery of Dr. T. Brailsford Robertson, Professor of Biochemistry. The substance having only recently been discovered, many features of its action are still obscure, and these are being worked out as rapidly as means and facilities permit. The experiments on the various aspects of the growth of animals are very laborious, as may be judged from the fact that

during the past two years over seven thousand weighings of animals treated with Tethelin have been made, together with some thirty thousand weighings of control animals or of animals receiving other substances suspected of exerting action upon the growth of tissues. The statistical handling of these figures is in itself a very onerous task. The feeding and care of so many animals has been a great work and expense; yet the numbers employed have been insufficient to enable the department to elucidate the various actions of Tethelin as rapidly as is desirable. Nevertheless distinct headway has been made, although our results are still far from complete.

In collaboration with Dr. E. L. Barney of the Department of Surgery a series of experiments upon the action of Tethelin on chronic ulcers has been carried out with striking success. Ulcers of from two months to eleven years standing, previously treated without success by a variety of methods, were in every case cured by treatment with Tethelin. The maximum number of applications required, in a case of eleven years standing, was twenty.

The University of California having leased its patent rights in Tethelin to the H. K. Mulford Company of Philadelphia, the problem of practical manufacture has been taken up by them in collaboration with this department. A series of practical difficulties have been successfully solved and the large scale production of Tethelin is now well under way, so that it will soon be available for general medical and surgical use.

Another phase of research having strong bearing upon the war has been the thorough investigation by Dr. E. S. Sundstroem during the past three years, of the effects of high altitude upon metabolism. He has complied a monograph upon this subject from the results of very numerous and laborious analyses. These results which will shortly be published have a strong bearing on the question of aviation sickness. He has reached the conclusion, which would seem to be adequately supported by his results, that

mountain sickness is due to an alkalosis, or increase in the alkalinity of the blood, which the body combats by an accelerated excretion of alkaline bases. This work is now to be extended and confirmed by further experiments, and to this end a large vacuum chamber has been constructed in which animals can be placed and kept at reduced atmospheric pressure for prolonged periods of time.

Department of Physiology

The most important war service of the Department of Physiology has been its regular work in the teaching of medical students, a number of whom after being drafted have been sent back by the military authorities to complete their medical education. Other work in instruction of the department is a necessary part of the education of nurses and of persons preparing for public health service.

In the latter part of April, Assistant Professor T. C. Burnett went to Camp Kearney to act as Associate Field Director in the American Red Cross. He has devoted the long summer vacation to this work.

The research work of the department all has more or less direct bearing on medical progress. Associate Professor S. S. Maxwell has been engaged in a study of the effect of certain drugs on the central nervous system. He has also made progress on a mechanical device for the rapid calculation of the proportion of the various food principles in dietaries and individual ration allowances.

Assistant Professor Burnett has attempted the application of an internal lavage of wounds by the production of an increased lymph flow. Instructor Lillian M. Moore has studied intensively the effect on body temperature of certain brain injuries; two parts of this work are completed and will appear in the June number of the *American Journal of Physiology*. Assistant J. A. Larson has been engaged on the study of the effect of extracts of the endocrine glands on the growth of tissue.

Dr. E. S. May has made encouraging progress in the study of the pathway of temperature impulses in the spinal cord, a matter of great importance in diagnosis of results of certain sorts of wounds.

Los Angeles Medical Department

The Los Angeles Medical Department of the University became engaged in aviation examination work at the beginning of the war, and word has just been received from the War Department that it is desired again to start this work in Los Angeles for the entire Pacific southwest. The Los Angeles Medical Department has loaned a large portion of its hospital building to the Medical Examining Board of the Los Angeles District. The department has in contemplation a plan whereby graduate instruction may be given to medical officers in the near-by camps and cantonments, and also to such other physicians as are entering the service and likely to be called upon by the government to do a certain amount of hospital work.

Hooper Foundation for Medical Research

The Hooper Foundation offered a course in laboratory training, open to women, during the summer session of 1918, the object being to prepare individuals for technical positions in the base hospitals. There is urgent need for such technicians.

Each month a group of army officers is detailed to the school for intensive training. This work takes considerable time, but the teachers in charge have faithfully discharged all their other duties in addition to this new branch of service.

Dr. K. F. Meyer, Associate Professor of Tropical Medicine, applied himself to studying typhoid carriers, the epidemiology of dysentery infections on the Pacific Coast, types of pneumococci and streptococci found in cases of pneumonia, spore-bearing anaërobes responsible for gas

gangrene, and toxin production of anaerobes concerned in wound infections. The school is now in possession of a complete series of anaërobes isolated from war wounds in France.

Dr. Alice Rohdé, Assistant Professor of Research Medicine, has been engaged in an experimental study of Dakin's Solution with particular reference to its action on ferment and autolysis of various tissues.

Dr. E. L. Walker, Associate Professor of Tropical Medicine, has investigated the treatment of carriers of andamoebic dysentery, and the chemotherapy of infectious diseases due to the acid-fast bacilli, with special reference to tuberculosis. He has also investigated the obscure etiology of certain infectious diseases—leishmaniasis, myositis, purulenta tropica, granuloma inguinale, etc., with material collected in South America.

Although Dr. C. W. Hooper, Assistant Professor of Research Medicine, has been called to the Hygienic Laboratory in Washington, Mrs. F. W. Robscheit, Fellow in the Hooper Research Laboratory, and Dr. G. H. Whipple, Professor of Research Medicine and Director of the Hooper Foundation for Medical Research, are continuing the work of studying pigment metabolism and anemia. Dr. Whipple, assisted by Messrs. Davis, Foster and McQuarrie, is investigating the peculiar condition of shock which develops in animals, caused by dilution of the blood plasma effected by plasmapharesis. The exchange of fluid between the blood and tissue has a definite bearing on clinical shock.

DEPARTMENT OF MINING AND METALLURGY

The facilities of the College of Mining, its teaching staff and several of the students have been employed in work thought to be of importance at this time. Supplementing these activities, experiments of value in devising ways and means of increasing the production of metals, the demand for which has been created by the war, have been greatly encouraged.

An exhaustive study has been made of the possibilities of concentrating, beneficiating and rendering available the low grade, manganese ores of California, particularly for use in the manufacture of ferroalloys. A very comprehensive and exhaustive report was prepared by E. A. Hersam, Associate Professor of Metallurgy, and published in the University of California Press, March 26, 1918 (Engineering ser., vol. 2, pp. 1–56). The great demand for copies of this work has led to its wide circulation throughout the state.

The treatment of antimony ores with particular reference to the temperature conditions of roasting was studied by G. McM. Ross, under direction of the department. The results of this work are now being utilized and are available for public information.

In coöperation with the California State Mining Bureau, a complete study of the possibilities of concentrating quicksilver ores has been undertaken, the results of which were made the subject matter of a thesis presented by W. W. Bradley for the degree of mining engineer in the University. A report will be issued by the California State Mining Bureau reviewing the metallurgical treatment of quicksilver ores, and embodying the results of his researches.

V. S. Chow, under the guidance of the department, investigated the conditions prevailing in the distillation and condensation of cinnabar ore. His conclusions are offered for the master's degree in metallurgy.

The electrical equipment for electrofusion experimentation has been completed and certain initial work in electrometallurgy has been carried on. This will be continued in the studies of ferroalloys.

An extended series of experiments to determine limitations in the oil flotation of manganese ores has been conducted by A. M. Sperry, a senior in the College of Mining.

In the hope of finding an economical and commercial method of concentrating chromite-bearing sands of the western coast, many elaborate experiments were conducted by E. V. Daveler and H. I. Altshuler. The results, while not immediately practical, are nevertheless sufficiently encouraging to justify continued investigation.

Dr. S. Trood and H. B. Hyder have, under the direction of W. S. Morley, Assistant Professor of Metallurgy, experimented on the possibilities of the direct reduction of iron, manganese and other ores; the information thus obtained led to the building of a test plant at Herroult, California. This type of work is vital to the solution of many problems in the economy of iron production in the West.

Mr. John Bouse, under the direction of Professor Hersam, conducted some large scale experiments to determine the possibilities of recovering and refining copper from waste metal such as brass, bronze and foundry sweepings, by hydroelectrolytic treatment. The result, thus far, has thrown light on the great problem of preventing waste of valuable metal and adding to the nation's supply of refined materials.

Charles A. Hyder has critically investigated the possibility of the manufacture of ferromagnesite used in the steel industry, hoping to be able to make an acceptable substitute for the magnesite heretofore imported from Austria.

Professor Morley has made a number of metallographic investigations on the steel parts used in airplane motors for the Hall-Scott Motor Company, and has also conducted

detailed mieroscopic analyses of steel for the Equipment Production Engineering Department of the United States Signal Corps.

L. C. Uren, Assistant Professor of Mining, made some preliminary investigations of the blanketing action of certain froths in preventing evaporation losses of oils. He also delivered a course of eight lectures on the Meehanical Handling of Industrial Materials in the Ordnance Storekeepers' Sehool on the Campus. He devoted four hours a week to the University of California Military Bureau as assistant manager. As assistant to the Fuel Oil Administrator of California, Professor Uren has undertaken special investigative work in the California oil fields. Professor Uren has been commissioned Captain in the Chemical Warfare Service and has been sent overseas.

The Berkeley Experiment Station of the United States Bureau of Mines, under the direction of Dr. L. H. Duschak, has devoted its energies during the last year exclusively to the investigation of problems bearing directly on the production of war minerals. A few advanced students of the College of Mining have collaborated in this work.

DEPARTMENT OF PALEONTOLOGY

J. C. Merriam, Professor of Palaeontology and Historic Geology, has been made chairman of the scientific branch of the State and National Council of Defense and is now in Washington, D. C., engaged in work of a highly important character for the National Council of Defense.

Chester Stock, Research Assistant in Palaeontology, is a member of the Pacific Coast Research Conference.

Mussel Survey

The chief work of the Department of Palaeontology has been its survey of mussels in California as embodied in its report to the Zoological Committee of the State Council of Defense.

The mussel survey of the coast of California was begun by C. A. Kofoid, Professor of Zoology. The general purpose was to encourage, so far as possible, the use of mussels as food, the object being to increase both the supply and the demand. In order to increase the supply, it was planned to induce the canneries along the coast to pack mussels. As a direct aid to the canneries, it was proposed to make a survey of the coast to determine where the shellfish could be found in abundance, and also to determine as far as possible the tonnage which the canneries might expect to collect at different localities.

Professor Kofoid began his work early in the summer of 1917. The publicity part of the work was delayed, however, due to the occurrence during the summer of several cases of mussel poisoning, raising the question as to whether it was safe to encourage further the use of mussels at this time.

The Bureau of Fisheries detailed two men, E. P. Rankin, Biologist of the ship "Albatross," and H. L. Kelly, Statistician, to work under Professor Kofoid's direction. Professor Kofoid also asked Bruce L. Clark, Instructor in

Palaeontology of the University, to help in the quantitative survey. Messrs. Rankin, Kelly, and Clark were directed to make a detailed examination of the quantity of mussels along the California coast. Mr. Kelly was assigned to the coast south of San Francisco, while the coast north of San Francisco to the Oregon line was assigned to the other two. This work was begun about the last of October, 1917. On account of winds and rains the survey in the north was discontinued about December 1.

A large part of Professor Kofoid's attention was given to the study of the mussel-poisoning problem, and a series of tests on guinea pigs was made in coöperation with the State Board of Health. The final conclusions were that mussel poisoning is not apt to occur provided the shellfish are collected in the proper places and at the right time of the year and that if the proper precautions are taken in collecting the mussels, they are a good substitute for fish and meats.

When Professor Kofoid entered the Sanitary Corps of the United States Army he asked Dr. Clark to continue the work of the survey, as chairman of the subcommittee. It was agreed that Mr. Rankin should be a member of the committee and that the two, with further coöperation from Mr. Kelley, should continue the work.

The main purpose of the survey of the distribution and abundance of the mussel, *Mytilus californicus*, along the coast of California is to determine its possible commercial utilization as a food product. It is proposed, in carrying on this investigation, to visit all the important localities along the coast where the mussel is found in any great abundance. The preliminary report on the distribution of *Mytilus californicus* in California by Dr. Harold Heath *et al.* to the California Fish and Game Commission is being used as a guide to the most important localities. At every locality where mussels are present in sufficient quantity, an estimate is to be made of the tonnage. This will be done

by obtaining an estimate of the square yards of area covered by the mussels; from this, the weight can be computed with fair accuracy. Tests to determine the accuracy of such measurements have been made.

An estimate of the amount of meat per ton of the unshucked mussels is being made. This will be checked against canners' experience.

Notes are being taken as to the conditions under which the shellfish will have to be gathered at the various localities, and also as to the accessibility of the different localities to the market or canneries. The question of the rate of growth of the individuals has been studied in order to ascertain the proper lapse of time between successive collecting periods.

Those making the survey are securing all available information concerning the different cases of mussel poisoning, and also all possible data concerning the enemies of the mussels, and the parasitic diseases with which they may be infected.

A study is being made as to the size at which the mussel is most edible, and in this connection all data on the food value of the shellfish and methods of preparing it for the table are being collected.

Data as to period of spawning and the sexual characters of the species are being brought together, while suggestions will be sought as to methods of collecting, marketing and canning.

A campaign has been begun to acquaint the public with the possibilities of the mussel as a food. A series of articles on the mussel, its value as a food, etc., is being sent to about six hundred newspapers throughout the state. M. E. Jaffa, Professor of Nutrition, has consented to write a University bulletin, and has also prepared popular articles for newspapers on the food value of the mussel. Miss Jessica Hazzard, of the Los Angeles State Normal School, is bringing together all known recipes for cooking mussels, and is experimenting to discover new ways of preparing this food.

The results of her experiments also will be published as a bulletin.

Mr. Rankin has written to all the canneries along the California coast to find out whether they are willing to commence canning mussels. A number of replies have been received, and in every case the answer has been that if the canneries could be assured a market for the product they would be very glad to can them.

Further investigations of the cause of mussel poisoning have been conducted. While it is believed, with Professor Kofoid, that mussel poisoning is not a serious danger provided the necessary precautions are taken in collecting, yet it seemed best to have more positive evidence to present to the public as to the causes. With this in mind, arrangements were made with the State Board of Health to continue the experiments on guinea pigs. It is proposed to subject the live mussels to different degrees of heat for different lengths of time, after they have been taken out of the water, in order to ascertain whether or not the poisoning is really due to heat and exposure. Dr. T. B. Robertson, former Professor of Biochemistry of the University, has written a statement as to the possible character of the poisoning. A circular letter has been sent to all the physicians connected with the State Board of Health, asking for information concerning mussel poisoning.

CALIFORNIA COLLEGE OF PHARMACY

The College of Pharmacy has responded promptly to every government call for pharmacists, with the result that ninety-one graduates and students are in the military service of the country. A gold star, representing J. M. Simmons, class of '14, marks the service flag. A course in Military Hygiene and First Aid has been of material assistance to the military authorities about the bay counties.

Dr. H. M. Simmons, Associate Professor of Materia Medica and Pharmacy, and Lecturer on Toxicology, and Dr. H. B. Carey, Professor of Botany, Materia Medica and Physiology, and Instructor in Anatomy, Histology, Materia Medica and Therapeutics, are serving the exemption boards in their districts.

DEPARTMENT OF PHYSICS

The shop of the Department of Physics has been used for the construction of special apparatus and for repair work for the School of Military Aeronautics, for the Signal Corps under the direction of Captain G. M. Stratton, Professor of Psychology, and for the Shipping Board under the direction of E. E. Hall, Associate Professor of Physics.

L. T. Jones, Instructor in Physics, is First Lieutenant in the Aviation Corps; W. P. Roop, Instructor in Physics, is Lieutenant in the Naval Reserve; Grandison Garner, Assistant in Physics, is Second Lieutenant in the Army; C. E. Pierce, Assistant in Physics, is in Company B, California Engineers; H. O. Russell, Assistant in Physics, is in the Aviation Corps; L. A. Welo, Assistant in Physics, has been detailed to the Forest Testing Laboratory, C. H. Kunsman, Whitney Fellow in Physics, is civilian instructor in the School of Military Aeronautics; H. H. Anderson, Whiting Fellow in Physics, is enlisted in the Signal Corps; Paul Taylor, Assistant in Physics, is civilian instructor in the School of Military Aeronautics.

E. P. Lewis, Professor of Physics, has served in a confidential capacity for the National Research Council. He is chairman of the Physics Committee and a member of the Committee on Engineering and Invention of the Conference Committee of the State Council of Defense.

Professor Hall has carried out certain tests in connection with the research work of the United States Shipping Board.

DEPARTMENT OF PHYSICAL EDUCATION

Under normal conditions the activities of the Department of Physical Education for Men are largely of such a nature that they may be classed legitimately as military training. It is the aim of the department to maintain and improve the health of all male students, and to develop in them those mental, moral and physical traits imperative to success in military life. The method of procedure followed by the department during the past three years is cited by the office of the United States Commissioner of Education in his recommendations to the National Council of Defense as typical of the method of physical education to be followed throughout the colleges of the country as an aid in military training.

The chief war work of a specific nature in which the department has been engaged is that of organizing and conducting the athletics of the School of Military Aeronautics.

This department has also given special instruction to the University of California cadet officers for the purpose of fitting them to drill men in the official army calisthenics as set forth by Major Koehler of West Point; it has likewise trained the prospective naval officers enrolled in the naval preparation course at the University in the official Navy calisthenics. These differ decidedly from those of the Army.

In the organization of teachers' training courses for both the fall and summer session, this department has been making special efforts to meet the overwhelming demand for competent teachers in this field. It is also expecting to lend assistance to the Medical School in the development of its prospective plan for the training of reconstruction aides.

Classes have been organized to accommodate faculty men, several of whom have undertaken the work to fit themselves for military service.

Special corrective gymnastics have been conducted for the correction of flat-foot and kindred ailments barring men from the military service. A bulletin on foot hygiene and the correction of flat-foot was compiled for publication by the Military Bureau. This bulletin has been in great demand and has been highly appreciated by various military authorities.

The members of the department are publishing, through the *American Physical Education Review*, a *Manual on War Sports*, for use in high schools and army camps. The department has been asked by the Berkeley Board of Education to make a survey of the Berkeley schools and to recommend proper equipment and methods to meet the double demand of military and physical training.

F. W. Cozens, Instructor in Physical Education, is Instructor in Calisthenics in the School of Military Aeronautics.

The Department of Physical Education for Women is represented on the honor roll by Miss Maude Cleveland, Director of Women's Gymnasium and Assistant Professor of Physical Education, who is serving the government in France.

SCRIPPS INSTITUTION FOR BIOLOGICAL RESEARCH

Kelp Industry

The function of the Institution in the kelp industry is to supply the State Fish and Game Commission information and advice based on scientific inquiry, as to when the different kelp beds shall be declared open and when closed, i.e., when they may and when they may not be harvested, the Commission being empowered by law to make and enforce the regulations.

The requisite information is obtained by general and special inquiry. "General inquiry" consists in rather frequent general examinations of the beds to ascertain the state of growth, areal abundance, health, etc., of the plants. "Special inquiry" consists in botanical studies on the plants, such problems as their sporulation, embryogeny, bacterial infection, etc., being involved.

The work is in the immediate charge of Mr. W. C. Crandall, Business Agent of Scripps Institution. The botanical investigations are being conducted by Dr. R. P. Brandt.

The somewhat elaborate scheme of dividing the entire kelp area into numbered units and securing a "gentleman's agreement" among the harvesting companies as to who shall cut in different places, is largely due to Mr. Crandall. Funds for prosecuting this work are derived from a state imposed tonnage tax on the wet kelp harvested, the proceeds being allotted jointly to the State Game and Fish Commission and the Scripps Institution.

Fishing Industry

Work of the Institution relative to the fishing industry is of several kinds and may be classified according to the agencies by which they are carried on.

1. The Institution in coöperation with the United States Bureau of Fisheries.

During and for some time after the fishing season of 1917, experimental fishing was carried on for the purpose of ascertaining more definitely than the industrial fishing has determined, the area over which tuna, the long finned albacore, may be obtained; where these fishes go when they leave the fishing area in the fall, and other matters involving the distribution and life habits of the fish. The aim of this work was to get information which would enable the fishermen to ply their vocation more effectively and to increase the output.

Also in connection with the Bureau of Fisheries, a report, as exhaustive as possible, is being prepared on the relation of the fishing done in waters under the jurisdiction of the United States and those of Mexican jurisdiction and influence. The aim of this study is to ascertain the relative amounts of fish taken under the two jurisdictions and from the high seas; conditions as to concessions for fishing in Mexican waters, and as to fees and other charges exacted by the Mexican government and Mexicans; and other matters affecting the industry and international questions involved therein.

The Bureau of Fisheries furnishes the money expended directly on these inquiries, the Institution contributing certain facilities, and some labor of its scientific staff and workmen. The scientific director of the Institution has been appointed Director of Operations by the Bureau for its work in this region and Mr. W. C. Crandall, its special agent for certain purposes.

2. The Institution in coöperation with the Bureau of Chemistry and the Federal Food Administration.

The work here consists of experimentation on methods of preserving fish other than canning. Smoking, kippering, dry-salting and brine-salting are being tried, and various species of fish are being utilized, special attention being given to sardines too large for canning.

The Bureau of Chemistry has assigned an expert, Mr. Horace Davi, to this work; the Institution providing

laboratory and other facilities and the fresh fish, in part, used in the experiments.

3. In coöperation with the Council of Defense of California.

The problem undertaken in this connection was that of bringing the Institution's programme of research on the plankton as the fundamental food supply of commercial fishes, and on the hydrography of the fishing area as part of the environment of the fishes, into the service of the fishing industry. The aim here has been twofold: the possible increase of productiveness of the industry, and the furnishing of information on which to base regulative and protective measures for the fishing industry. The funds supplied by the Council of Defense for this work during the last year will not be continued next year, but the Institution plans to keep up the investigation in part, at least, on its own account.

4. Mr. Crandall is serving as Fish Administrator for Southern California under the National Food Administration. This responsible position absorbs the major part of Mr. Crandall's time.

SUMMER SESSIONS OF 1918

The two summer sessions of 1918 were war sessions. The following courses will give some idea of the channels of work in which the students were engaged: Automobile Construction, Contemporary Social Problems, Elementary Bacteriology, Elementary Cooking, Essentials of Public Health, Europe since 1815, First Aid, Food and Dietetics, French Civilization, Geography of Europe, General Athletics, Government of Germany and Prussia, History of Germany and Prussia, History of American Diplomatic Relations, Home Care of the Sick, Juvenile Delinquency, Medical and Psychological Problems, Military German, Military Sketching, Navigation and Nautical Astronomy, Plane Trigonometry, Political Development of Modern Russia, Political Institutions of France, Principles and Practice of Vocational Guidance, Problems of Individual and National Conduct, Radio Telegraphy.

Five definite schools occupied twelve weeks of intensive war training: (1) School for the Training of Reconstruction Aides, (2) School for Nursing, (3) School of Social Economics, (4) School for Stenographers, (5) School for Laboratory Technicians.

During both sessions a number of speakers representing various nations of the Allies and patriotic organizations, addressed the students and the general public on war topics.

For the first time in the history of the University a summer session was held in Los Angeles from June 24 to August 3. The reports of attendance indicated that the experiment was a decided success.

At Berkeley the attendance of 3417 far exceeded the most sanguine anticipations. The total number of 4016 students registered at Los Angeles and at Berkeley was greater than any previous summer session enrollment in the history of the University. The popularity of the ses-

sion was due, no doubt, to the predominance of war courses and to the feeling of the students that preparation for personal efficiency was preparation for national service.

STUDENT PARTICIPATION IN WAR ACTIVITIES

The National Service Committee, an organization consisting of seven students appointed by the President of the Associated Students of the University of California, raised $40,000 on the campus, this to be divided among the various war and civilian charities. During the Second Liberty Loan campaign, bonds to the extent of $73,000 were sold. During the next campaign, the committee disposed of approximately $60,000 worth of bonds.

The University of California Auxiliary to the Berkeley Chapter of the American Red Cross maintains work rooms in Hearst Hall which are open every afternoon. During the year 1917–1918 the women of the University completed more than 15,000 surgical dressings, 700 hospital garments, 2000 knitted articles, 425 Christmas packages, 200 pounds of trench candles, and have equipped and sent out four emergency kits.

More than two thousand dollars' worth of thrift stamps have been sold, thousands of copies of the *Daily Californian* have been sent to the University's soldiers in France, and the Red Cross has been aided from time to time by donations of clothes, shoes, and money from the sale of paper.

WILMERDING SCHOOL OF INDUSTRIAL ARTS

Two hundred and thirty graduates of the Wilmerding School of Industrial Arts are now in active service. Due to their mechanical training, many of them have been assigned to the signal corps, the aviation service, the auto-truck service and other branches where such training is needed.

The active students are organized as a branch of the Junior Red Cross. A fund of one thousand dollars has been raised with which to manufacture hospital equipment needed for various camp activities. The shop students are also at work trying to solve an important problem for one of the military hospitals, namely, to keep food warm while in transit from the general kitchen to twenty-four different wards, and while being served to the individual patients.

A ten weeks course in First Aid was well attended by both boys and girls. The students have bought upwards of a thousand dollars' worth of thrift stamps, and several class organizations have bought liberty bonds. Many of the boys are in the Boys' Working Reserve and have aided the farmers throughout the state during the summer vacations.

B. O. Weeks '16 went down with the Tuscania, and C. V. LeGal '17 died in France.

Mr. F. M. Williams, teacher in science, has enlisted in the service, and Mr. A. Hood, foreman in the electrical shop, reported for duty on June 1, 1918.

Geo. A. Merrill, Director of the Wilmerding School, has been a member of the San Mateo County Draft Board since July 1, 1917, serving as secretary of the board from July 1 to December 31, 1917, and as president since that time.

DEPARTMENT OF ZOOLOGY

The principal work of the Department of Zoology has been its active efforts to eradicate the hookworm from certain infested districts in California. Besides personal visits to those districts, the staff has outfitted a room in East Hall for rapidly making examinations to detect the presence of the hookworm and other intestinal parasites. The results thus far have been encouraging and give grounds for the hope that the hookworm infection may be completely eradicated from the state.

Dr. C. A. Kofoid, Professor of Zoology and Assistant Director of the Scripps Institution of Biological Research, and Dr. S. J. Holmes, Professor of Zoology, are members of the Committee of Zoological Research of the State Council of Defense. The former, in collaboration with Dr. B. L. Clark, Instructor in the Department of Palaeontology, has devoted considerable time to the study of mussel poisoning in California. Dr. Kofoid is a Major in the Sanitary Corps, and W. A. Boeck, graduate student, is Assistant in the Sanitary Corps.

Dr. H. C. Bryant, Economic Ornithologist, California Museum of Vertebrate Geology, is a member of the Subcommittee of Zoological Investigations of the Pacific Coast Research Conference.

A. L. Barrows, Instructor in Zoology, is First Lieutenant, O. R. C., Machine Gun Battalion.

PERSONAL SERVICES OF MEMBERS OF THE FACULTY

Department of Anthropology

Mr. W. C. McKern, Research Fellow in the Department of Anthropology, has enlisted in the Army. Other members of the staff have been prominent in Red Cross and Liberty Loan drives.

School of Architecture

The School of Architecture has been of material aid to the School of Military Aeronautics in contributing the use of its rooms for the making of important maps. One member of the staff is in the artillery, while the course in naval engineering has claimed a number of architecture students. Three of the women students are in service at Mare Island, and a fourth one is assisting the Extension Division of the University of California in courses on Naval Construction.

Department of Drawing and Art

P. W. Nahl, Instructor in Freehand Drawing and Art Anatomy, has made a large map used for observation purposes in the School of Aeronautics. Courses in drafting have been designed to aid art students who enter branches of the service requiring this technical knowledge.

Herman Kower, Associate Professor of Drawing, is a member of the Pacific Coast Research Conference.

Department of Education

C. E. Rugh, Professor of Education, is chairman of the State Committee in charge of the "Go-to-College" campaign instituted by the Committee on Education and Special Training, War Department, Washington, D. C., and endorsed by President Wilson and Secretary Franklin K. Lane.

W. W. Kemp, Professor of School Administration, for the past year has been a member of the Children's Committee of the Associated Charities of San Francisco, which committee has devoted itself almost entirely to the problem of juvenile moral delinquents as a menace to the military cantonments in California. He has also been a member of a joint committee selected from this and other civic agencies in the state which assembled and placed before the Governor and the State Board of Control data concerning the above problem. During May and June he was assistant in the Military Bureau.

Department of English

C. M. Gayley, Professor of the English Language and Literature, and Dean of the Faculties, is in the service of the Liberty Loan Committee of the Twelfth Federal Reserve District, the Pacific Division of the American Red Cross, the Y. M. C. A., the State Council of Defense, and other patriotic organizations. He has delivered many addresses and has written numerous articles in support of the cause of the United States and the Allies.

W. M. Hart, Associate Professor of English Philology, as Dean of the 1918 Summer Sessions, has organized the courses of instruction with a view to their practical bearing upon immediate war service and the problems issuing from the war. He is serving as one of the Four Minute Men.

B. P. Kurtz, Associate Professor of English, has spoken during the Red Cross and War Savings Stamp drives and has delivered war speeches in several of the high schools of the state.

T. F. Sanford, Assistant Professor of English Literature, has aided the Red Cross in San Francisco.

G. R. MacMinn, Instructor in English, has assisted in the Military Bureau; under the direction of this bureau H. E. Cory, Assistant Professor of English, and A. G. Brodeur, Instructor in English Philology, have written a number of articles on subjects connected with the war.

H. L. Bruce, Assistant Professor of English Composition during the summer of 1918, was temporarily employed in one of the government's shipyards.

Leonard Bacon, Instructor in English, is Lieutenant in the American Air Service, at San Diego; R. H. Clark and R. G. Ham, instructors in English, have entered the military service; and Guy Montgomery, Instructor in English, has taken part in the activities of the Four Minute Men.

Department of Geography

The Department of Geography gave part of the instruction in the courses preparatory for naval service offered during the University year 1917–18. The course in Oceanography and Marine Meteorology was conducted by R. S. Holway, Associate Professor of Physical Georgraphy, and B. M. Varney, Instructor in Geography.

The School of Military Aeronautics has made use of the department's laboratory for the construction of a model in relief of a portion of Belgium.

Department of German

C. H. Bell, Instructor in German, has been commissioned Captain in the Quartermaster's Division of the United States Reserves and is on duty in the military postoffice at Hoboken, New Jersey. H. K. Schilling, Professor of the German Language and Literature, Franklyn Schneider, Instructor in German, and L. M. Price, Instructor in German, have volunteered their services for war work, and more recently have responded to a call from the Office of Naval Intelligence, of the Navy Department, for "linguists who speak and write German fluently." At this writing, however, they have not been given the opportunity to do actual service.

Department of Greek

The activities of the Department of Greek have necessarily been confined to the personal endeavors of its staff. J. T. Allen, Associate Professor of Greek, is associate member of the Berkeley Board of Legal Advisors, while G. M. Calhoun, Assistant Professor of Greek, has been Assistant Manager of the Military Bureau.

Department of History

The Department of History has given a number of courses bearing directly on the events that led to the present war. H. Morse Stephens, Sather Professor of History, lectured during the spring term of 1918 on the History of Europe since 1815. This course was duplicated in the 1918 Summer Session.

Herbert E. Bolton, Professor of American History and Curator of Bancroft Library; C. E. Chapman, Assistant Professor of Latin-American and California History, and K. C. Leebrick, Assistant Professor of History, have all aided in Red Cross and Liberty Loan drives, and are official Four Minute Men. Professor Leebrick is at present in charge of the War Aims course in the School of Vocational Training. Professor Bolton is a member of the board of editors of the *California War Bulletin* published under the supervision of the State Council of Defense. R. F. Scholz, Assistant Professor of Ancient History, has been assistant in the Military Bureau.

The following present or former members of the department are in active service: F. W. Rübke, Assistant in History, Officers' Training Corps, Camp Lewis; E. R. Brite, former secretary of the department, Regimental Sergeant Major, A. E. E.; D. V. H. Stearns, former secretary, Corporal, Depot Brigade, Camp Lewis; C. G. Davidson, Assistant in History, First Lieutenant, Canadian Army, received the Military Medal; he was severely wounded in combat but recovered; Keith Vosburg, Assistant in History, First

Lieutenant, A. F. S., A. E. F., received the *Croix de Guerre* March 2, 1918, for bravery under fire; T. B. Kittredge, Assistant in History, Lieutenant (Senior Grade), Navy; J. M. Scammell, Assistant in History, Captain, A. E. F.; J. G. Iliff, Assistant in History, with the Y. M. C. A. in France; E. G. Sewell, former secretary, First Lieutenant, A. E. F.

Department of Irrigation

During the current year the Department of Irrigation has given valuable information and advice to those writing to the University for assistance in the development and use of water for irrigation. Owing to war conditions there has been an added amount of correspondence, to which the department has gladly responded.

Department of Jurisprudence

A. T. Wright, Professor of Law, offered a course in Military Law covering such topics as martial law, court-martial, the rule of land warfare and other subjects likely to be of importance to those who are brought into relation with the military forces of the United States. He also gave a series of lectures in Military Law to the students enrolled in the various ordnance schools held on the campus. In addition, Professor Wright was Assistant Counsel to the United States Shipping Board and the United States Shipping Board Emergency Fleet Corporation.

A. M. Kidd, Professor of Law, is assistant in the Military Bureau, and is prominent in Red Cross work.

Mr. M. W. Dobrzensky, Lecturer in Commercial Law, entered the Fourth Officers' Training Camp, securing a Second Lieutenant's commission.

J. U. Calkins, Lecturer in Commercial Law, is First Lieutenant, O. R. C.

C. H. Lindley, Honorary Professor of the Law of Mines and Water, is Assistant to Herbert Hoover.

H. H. Phleger, Lecturer in Law, is Ensign, U. S. N.

Department of Latin

The war work of the Department of Latin has consisted in the personal services of its members. L. J. Richardson, Associate Professor of Latin, is Manager of the Military Bureau; Clifton Price, Assistant Professor of Latin, is assistant in the same office; O. M. Washburn, Assistant Professor of Classical Archaeology, and member of the Pacific Research Conference, also has been a great aid in the Bureau; M. E. Deutsch, Assistant Professor of Latin, was Registrar on Draft Registration Day; and W. A. Merrill, Professor of Latin Language and Literature, was Chief Registrar on Draft Registration Day.

Department of Mathematics

The Department of Mathematics has aided virtually every new "service" school which has been in any way connected with the University. B. M. Woods, Assistant Professor of Theoretical Mechanics, has devoted all his time to the School of Military Aeronautics; T. M. Putnam, Associate Professor of Mathematics, has directed the courses in naval preparation; M. W. Haskell, Professor of Mathematics, has given a special course in trigonometry to fifty-eight students in the Navigation School; Dr. Williams, lecturer in 1917–18, was given charge of one of the government schools in navigation. In addition, Thomas Buck, Assistant Professor in Mathematics, during the second half-year, served as secretary of the Committee on Research of the State Council of Defense. He has since been commissioned First Lieutenant in the Ordnance Corps. Dr. Barter, teaching fellow in 1917–18, is serving in the British army. Dr. Taylor has entered the Naval Aviation School at the Massachusetts Institute of Technology, and C. A. Noble, Associate Professor of Mathematics and Professor Haskell, are associate members of the Legal Advisory Board of Alameda County. D. N. Lehmer, Associate Professor of Mathematics, is a member of the Pacific Coast Research Conference.

Department of Philosophy

G. M. Stratton, Professor of Psychology, is Captain in the Air Service; A. U. Pope, Assistant Professor of Philosophy, has been engaged in government research work at Washington, D. C., and C. I. Lewis, Assistant Professor of Philosophy, is with the Artillery at Fort Scott, San Francisco.

Warner Brown, Assistant Professor of Psychology, is a member of the Subcommittee on Psychological Investigations of the Pacific Coast Research Conference.

Department of Political Science

Studies of European and world politics occupied a large portion of the Political Science courses. Problems of Reconstruction after the War, was given by William MacDonald, Lecturer in Political Science. The governments of France, England, and Germany were analyzed in courses given by Ludwik Ehrlich, Lecturer in Political Science. Edward Elliot, Professor of International Law and Politics, instructed two classes in International Law, one of these being a seminar in the most important issues which have arisen since August 1, 1914. During the year ten public lectures on topics bearing directly on the war were given in Wheeler Hall by Professor Elliott, Dr. MacDonald and Dr. Ehrlich. The entire staff gave frequent addresses throughout the state on war subjects, and have contributed liberally to the newspapers and periodicals on questions dealing most intimately with the war.

The following men have entered the service of the government: D. P. Barrows, Professor of Political Science, Major of Cavalry, Intelligence Section, U. S. A.; J. R. Douglas, Instructor in Political Science, Food Administration in Washington; J. R. Thomas, Teaching Fellow in Political Science, American Air Service; M. I. Lavine, Teaching Fellow in Political Science, Navy; M. W. Gra-

ham, Teaching Fellow in Political Science, Reconstruction Work in France; T. G. Chamberlain, Teaching Fellow in Political Science, Second Lieutenant, First Anti-Aircraft Battalion; R. M. Dorton, First Lieutenant, National Army.

Dr. MacDonald is a member of the United States Public Service Reserve.

Department of Public Speaking

The Department of Public Speaking has been especially active in furthering the war aims of the national government. Through its head, M. C. Flaherty, Associate Professor of Forensics, it has, in coöperation with the State Council of Defense, contributed its share towards making more efficient the work of the Four Minute Men. Classes were established for the training of these speakers, and for others who were preparing to aid the government in its publicity campaign. Model speeches were drawn up and forwarded to Washington to serve as guides for those engaged in speaking for the Liberty Loan issues. Individual speakers were coached for special occasions.

Under the direction of C. D. von Neumayer, Assistant Professor of Public Speaking, plays were given for the benefit of the Red Cross and Belgian Relief Funds. Other members of the Department of Public Speaking have given readings and recitals before gatherings of enlisted men. Graduate and undergraduate students in the department have toured the state in the interests of food conservation. Three of its teaching staff are now serving the colors.

Newton B. Drury, former instructor, is Second Lieutenant, Balloon Service, stationed at Arcadia, California.

George Boas, Instructor in Public Speaking, is First Lieutenant, A. E. F.

A. H. Hankey, Teaching Fellow in Public Speaking, is Second Lieutenant, A. S. E. R. C., A. E. F.

Department of Romanic Languages

The demand for French and Spanish has greatly increased as a result of the war, and the courses have been so arranged as to provide a speaking knowledge not only of the classical portion of the Romanic languages, but also of the war terms of everyday use.

L. M. Turner, Assistant Professor of French, a Lieutenant at Camp Kearney, is organizing French classes for officers and soldiers, while Gilbert Chinard, Professor of French, has coöperated in the publication of a French war vocabulary of a scientific character.

Alfred Solomon, Instructor in French, is with the Y. M. C. A. in France.

Department of Semitic Languages

Professor M. A. Meyer, Lecturer in Semitic Literature and History, has been active in civilian duty. He is Chairman of the Jewish Welfare Board of the United States Army and Navy, Northern California Branch; Director of the San Francisco Chapter, Red Cross; Vice-Chairman of the Civilian Relief Section, San Francisco Red Cross; committee member of the Syrian and Armenian Relief Fund; member of the British, French, and Belgian Commission for the Blind; and member of the Belgian Relief Commission.

William Popper, Associate Professor of Semitic Languages, has been collecting funds in Berkeley for the Young Men's Hebrew Association.

Department of Slavic Languages

Lieutenant Milutin Krunich, Assistant in Serbo-Croatian, has written an important war book entitled *Serbia Crucified*. The University of California is issuing it as one of its volumes in the Semicentennial Series.

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